IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
SHERMAN DIVISION

AMERICAN PATENTS LLC, Plaintiff, v. SEIKO EPSON CORPORATION and EPSON PRECISION PHILIPPINES, INC., Defendants.	CIVIL ACTION NO. 4:21-cv-718 ORIGINAL COMPLAINT FOR PATENT INFRINGEMENT **JURY TRIAL DEMANDED**

ORIGINAL COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff American Patents LLC ("American Patents" or "Plaintiff") files this original complaint against Defendants Seiko Epson Corporation and Epson Precision Philippines, Inc. (collectively, "Epson"), alleging, based on its own knowledge as to itself and its own actions and based on information and belief as to all other matters, as follows:

PARTIES

1. American Patents is a limited liability company formed under the laws of the State of Texas, with its principal place of business at 2325 Oak Alley, Tyler, Texas, 75703.

2. Seiko Epson Corporation is a corporation duly organized and existing under the laws of Japan having a place of business at 3-3-5 Owa Suwa-Shi, Nagano-Ken 392-8502, Japan.

3. Epson Precision Philippines, Inc. is a corporation duly organized and existing under the laws of the Philippines having a place of business at SEPZ, Lima Technology Center, Lipa City Batangas Province, 4217 Philippines.

4. The defendants identified in paragraphs 2-3 above (collectively "Epson and its affiliates") are part of an interrelated group of companies which together comprise one of the

world's largest manufacturers of consumer and commercial products, including under the Seiko and Epson brands.

5. Epson and its affiliates are part of the same corporate structure and distribution chain for the making, importing, offering to sell, selling, and using of the accused devices in the United States, including in the State of Texas generally and this judicial district in particular.

6. Epson and its affiliates share the same management, common ownership, advertising platforms, facilities, distribution chains and platforms, and accused product lines and products involving related technologies.

7. Epson and its affiliates regularly contract with customers regarding equipment or services that will be provided by their affiliates on their behalf.

8. Thus, Epson and its affiliates operate as a unitary business venture and are jointly and severally liable for the acts of patent infringement alleged herein.

JURISDICTION AND VENUE

9. This is an action for infringement of United States patents arising under 35 U.S.C. §§ 271, 281, and 284–85, among others. This Court has subject matter jurisdiction of the action under 28 U.S.C. § 1331 and § 1338(a).

10. This Court has personal jurisdiction over Epson pursuant to due process and/or the Texas Long Arm Statute because, *inter alia*, (i) Epson has done and continues to do business in Texas; and (ii) Epson has committed and continues to commit acts of patent infringement in the State of Texas, including making, using, offering to sell, and/or selling accused products in Texas, and/or importing accused products into Texas, including by Internet sales and sales via retail and wholesale stores, inducing others to commit acts of patent infringement in Texas, and/or committing a least a portion of any other infringements alleged herein. In the alternative,

Seiko Epson Corporation and Epson Precision Philippines, Inc. are subject to this Court's specific personal jurisdiction consistent with the principles of due process and the Federal Long-Arm Statute of Fed. R. Civ. P. 4(k)(2) because: (1) they have substantial contacts with the United States and committed and/or induced acts of patent infringement in the United States; and (2) they are not subject to jurisdiction in any state's courts of general jurisdiction.

11. Venue is proper as to Seiko Epson Corporation, which is organized under the laws of Japan. 28 U.S.C. § 1391(c)(3) provides that "a defendant not resident in the United States may be sued in any judicial district, and the joinder of such a defendant shall be disregarded in determining where the action may be brough with respect to other defendants."

12. Venue is proper as to Epson Precision Philippines, Inc., which is organized under the laws of the Philippines. 28 U.S.C. § 1391(c)(3) provides that "a defendant not resident in the United States may be sued in any judicial district, and the joinder of such a defendant shall be disregarded in determining where the action may be brough with respect to other defendants."

BACKGROUND

13. The patents-in-suit generally pertain to communications networks and other technology used in "smart" devices such as smartphones, smart TVs, and smart appliances. The technology disclosed by the patents was developed by personnel at Georgia Institute of Technology ("Georgia Tech") and Nokia Corporation ("Nokia").

14. Georgia Tech is a leading public research university located in Atlanta, Georgia. Founded in 1885, Georgia Tech is often ranked as one of the top ten public universities in the United States. The patents from Georgia Tech ("the Mody patents") were developed by a professor and a graduate student in Georgia Tech's Electrical and Computer Engineering

department. The undergraduate and graduate programs of this department are often ranked in the top five of their respective categories.

15. The Mody patents are related to Multi-Input, Multi-Output (MIMO) technology. The inventors of the Mody patents were at the forefront of MIMO, developing, disclosing, and patenting a solution for achieving both time and frequency synchronization in MIMO systems. The Mody patents (or the applications leading to them) have been cited during patent prosecution hundreds of times, by numerous leading companies in the computing and communications industries, including AMD, Alcatel Lucent, Altair, AT&T, Atheros, Blackberry, Broadcom, Comcast, Ericsson, Facebook, HP, Hitachi, Huawei, Infineon, Intel, Interdigital, IBM, Kyocera, Marvell, Matsushita, Mediatek, Motorola, NEC, Nokia, Nortel Networks, NXP, Panasonic, Philips, Qualcomm, Realtek, Samsung, Sanyo, Sharp, Sony, STMicroelectronics, Texas Instruments, and Toshiba.

16. Nokia is a Finnish multinational telecommunications, IT, and consumer electronics company. Listed on both the Helsinki Stock Exchange and the New York Stock Exchange, Nokia regularly makes the Fortune Global 500. Nokia has been the largest worldwide vendor of mobile phones and smartphones and has been a major contributor to the mobile phone industry.

17. The patent developed at Nokia ("the Rauhala patent") is related to reduction of interference in receivers with multiple antennas. The inventors of the Rauhala patent have a combined fifty plus years of experience at Nokia and were prolific inventors for Nokia. Inventor Jyri Rauhala spent over 25 years at Nokia. Mr. Rauhala obtained a Master of Science in Applied Electronics, Digital Electronics from Tampere University of Technology in Finland and is named as an inventor on 15 U.S. patents. Inventor Olli-Pekka Lunden spent over 8 years at Nokia. Dr.

Lunden obtained a Doctor of Science in Technology, Radio Engineering from Aalto University and is named as an inventor on 5 U.S. patents. Currently, Dr. Lunden works as a university lecturer at Tampere University of Technology in Finland. Inventor Marko Erkkila spent over twenty years at Nokia. Mr. Erkkila obtained a Master of Science in Digital Signal Processing, Electronics, Computer Science from Tampere University of Technology in Finland and is named as an inventor on 6 U.S. patents.

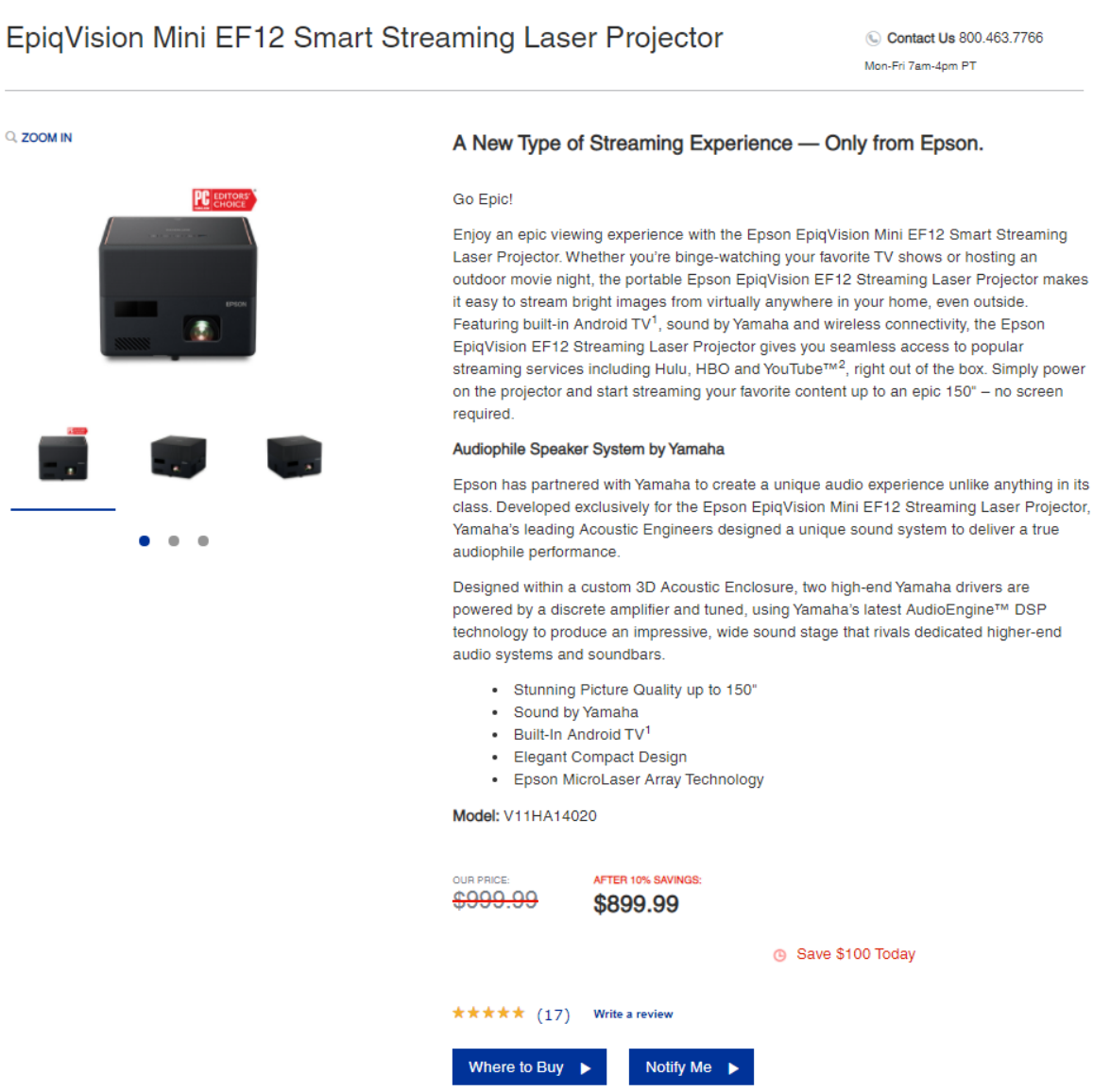
COUNT I

INFRINGEMENT OF U.S. PATENT NO. 7,088,782

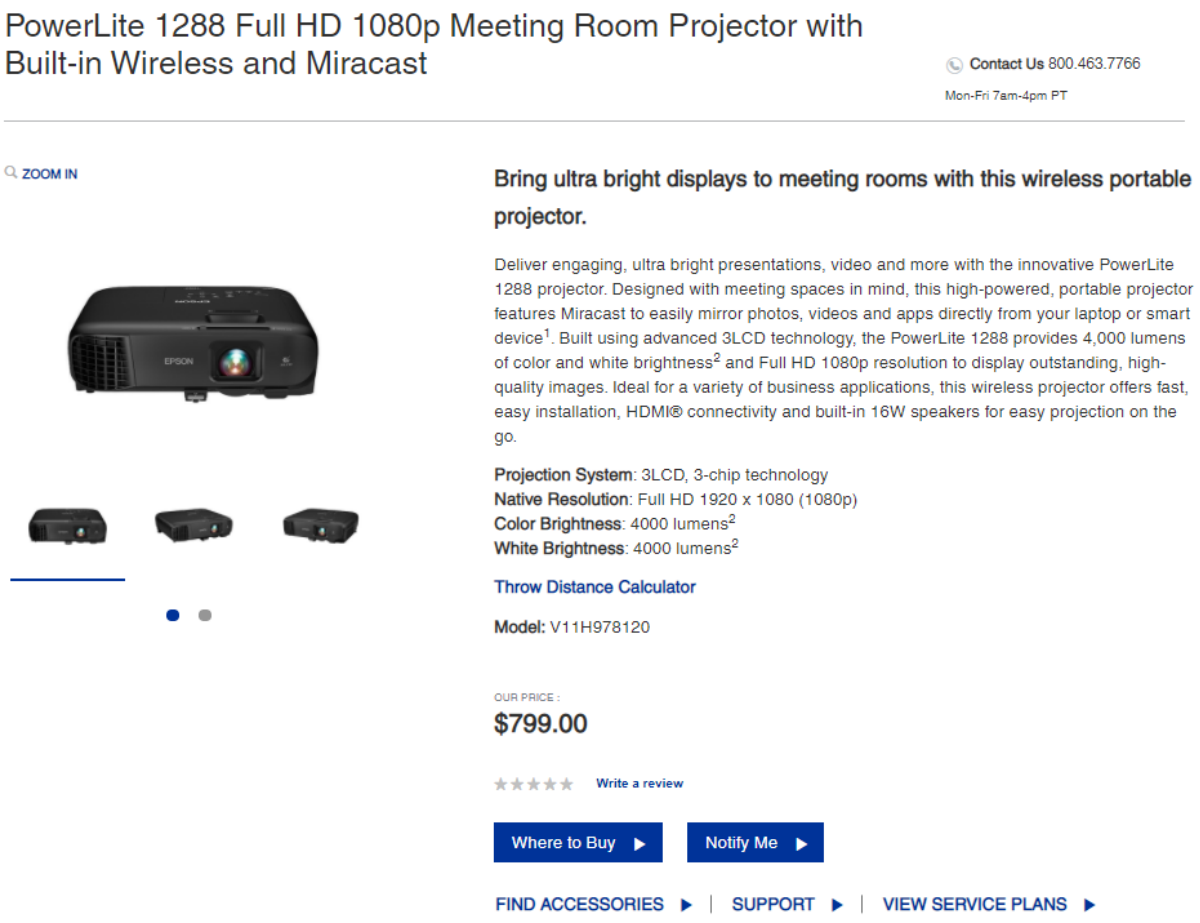
18. On August 8, 2006, United States Patent No. 7,088,782 ("the '782 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Time And Frequency Synchronization In Multi-Input, Multi-Output (MIMO) Systems."

19. American Patents is the owner of the '782 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '782 Patent against infringers, and to collect damages for all relevant times.

20. Epson used products and/or systems including, for example, its Epson EpiqVision Mini EF12 Smart Streaming Laser Projector, Epson PowerLite 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast, and Epson Moverio BT-40S Smart Glasses with Intelligent Touch Controller families of products that include 802.11n and above capabilities ("accused products"):



(Source : https://epson.com/For-Work/Wearables/Smart-Glasses/Moverio-BT-350-Smart-Glasses/p/V11H837020)

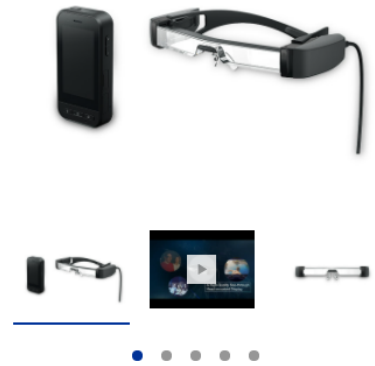


(Source : https://epson.com/For-Work/Projectors/Meeting-Room/PowerLite-1288-Full-HD-1080p-Meeting-Room-Projector-with-Built-in-Wireless-and-Miracast/p/V11H978120)

Moverio BT-40S Smart Glasses with Intelligent Touch Controller

Contact Us 800.463.7766
Mon-Fri 7am-4pm PT

ZOOM IN



See-through, AR glasses with smart touchscreen controller

Offering outstanding image quality and an intuitive touch controller, Epson Moverio BT-40S smart glasses take AR applications to the next level. Featuring innovative Si-OLED technology and dual-binocular displays – all in a comfortable design, they're the next generation of wearable, second-screen solutions.

The high-resolution display offers 1080p performance and a wide field of vision for stunning visual displays – to users, it's as if they're viewing a 120" screen from 16' away.

With a unique transparent display, Moverio BT-40S smart glasses allow you to keep an eye on your surroundings, even while viewing content. It's the perfect way to integrate digital information with the world around you.

Powered by the widely used Android™ 9.0 OS and certified by Google® Mobile Services, the included BO-IC400 touch controller offers an easy-to-use, open-platform interface. Equipped with a high-resolution, auto-focus camera, flashlight, proximity sensors and built-in audio, the BO-IC400 also offers pre-loaded productivity apps.

Combine the glasses with voice recognition technology over an active Internet connection for closed captioning or translation applications in movie theaters or classrooms . With a soft, flexible temple design, they're comfortable and easy for most anyone to wear, even over prescription glasses. And, they can be worn for long periods of time, with maximum comfort.

Whether used for subtitling, entertainment, museums or any other application, Moverio BT-40S smart glasses make it easy to enjoy a heads-up experience. And, with the intelligent controller, combined with the latest see-through optical technology, they're ideal for app developers looking to create new and innovative AR experiences.

- Full HD 1080p Si-OLED micro-projection technology
- 34° FOV, like looking at a 120" image from 15' away
- Transparent binocular displays
- Easy to wear with comfortable fit
- Simple user interface

Model: V11H969120

OUR PRICE :
$999.00

★★★★★ Write a review

Notify Me ▶

(Source : https://epson.com/For-Work/Wearables/Smart-Glasses/Moverio-BT-40S-Smart-Glasses-with-Intelligent-Touch-Controller-/p/V11H969120)

Wi-Fi CERTIFIED™ Certificate

This certificate lists the features that have successfully completed Wi-Fi Alliance interoperability testing. Learn more: www.wi-fi.org/certification/programs

Certification ID: WFA101028

Product Info

Date of Certification	July 8, 2020
Company	Seiko Epson Corporation
Product Name	Multimedia Projector[EF-12 series]
Product Model Variant	2020-07-08 (WFA101028 - 11359044)
Model Number	EF-12
Category	Computers & Accessories
Sub-category	Projector

Summary of Certifications

CLASSIFICATION	CERTIFICATION
Connectivity	2.4 GHz Spectrum Capabilities 5 GHz Spectrum Capabilities Wi-Fi CERTIFIED™ a Wi-Fi CERTIFIED™ ac Wi-Fi CERTIFIED™ b Wi-Fi CERTIFIED™ g Wi-Fi CERTIFIED™ n

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station — **Page 2 of 2**

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors | Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
Focal Length 18.2 – 29.2 mm
Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
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Moverio BT-40S Smart Glasses

Smart Glasses

Display
Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller
Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform
OS Version Android™ 9

CPU and Memory
CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors
Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity
Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface
Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats
Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input
USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer
USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output
Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other
Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/QZSS/BDS
Firmware Update Supports (OTA)

General
Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box
Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language
OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/HU/TR/RU/AR/KK

Developer Resources
Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features
RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

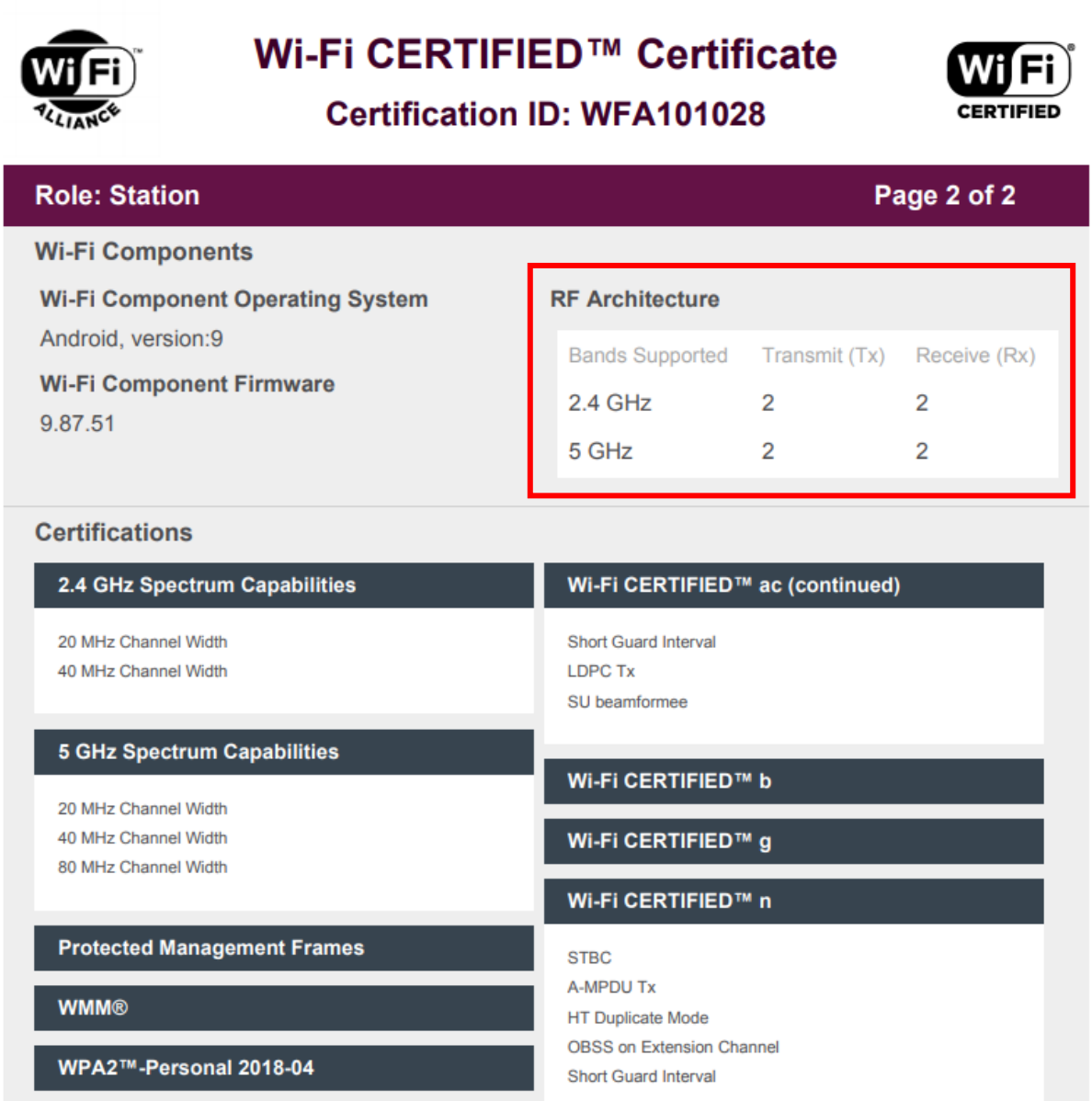
Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

21. By doing so, Epson has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 30 of the '782 Patent. Epson's infringement in this regard is ongoing.

22. Epson has infringed the '782 Patent by using the accused products and thereby practicing a method for synchronizing a Multi-Input Multi-Output (MIMO) Orthogonal Frequency Division Multiplexing (OFDM) system in time and frequency domains. For example, the accused products support IEEE 802.11 n/ac standards and MIMO technology. According to the IEEE 802.11n standard, the PLCP Protocol Data Unit (PPDU) has training fields and signaling fields for helping in synchronizing the communication system.



Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station — **Page 2 of 2**

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors
Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
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Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
EXCEED YOUR VISION

Moverio BT-40S Smart Glasses

Smart Glasses

Display

Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller

Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform

OS Version Android™ 9

CPU and Memory

CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors

Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity

Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface

Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats

Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input

USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer

USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output

Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other

Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/QZSS/BDS
Firmware Update Supports (OTA)

General

Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box

Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language

OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/HU/TR/RU/AR/KK

Developer Resources

Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features

RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

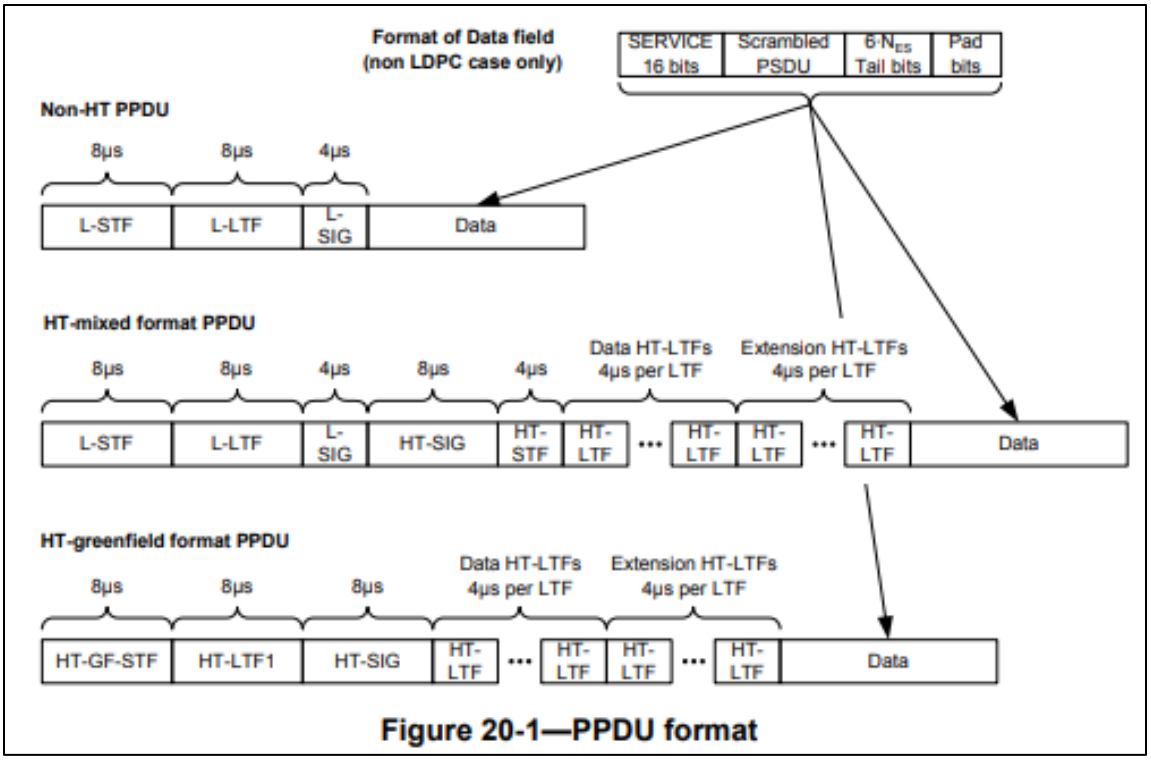


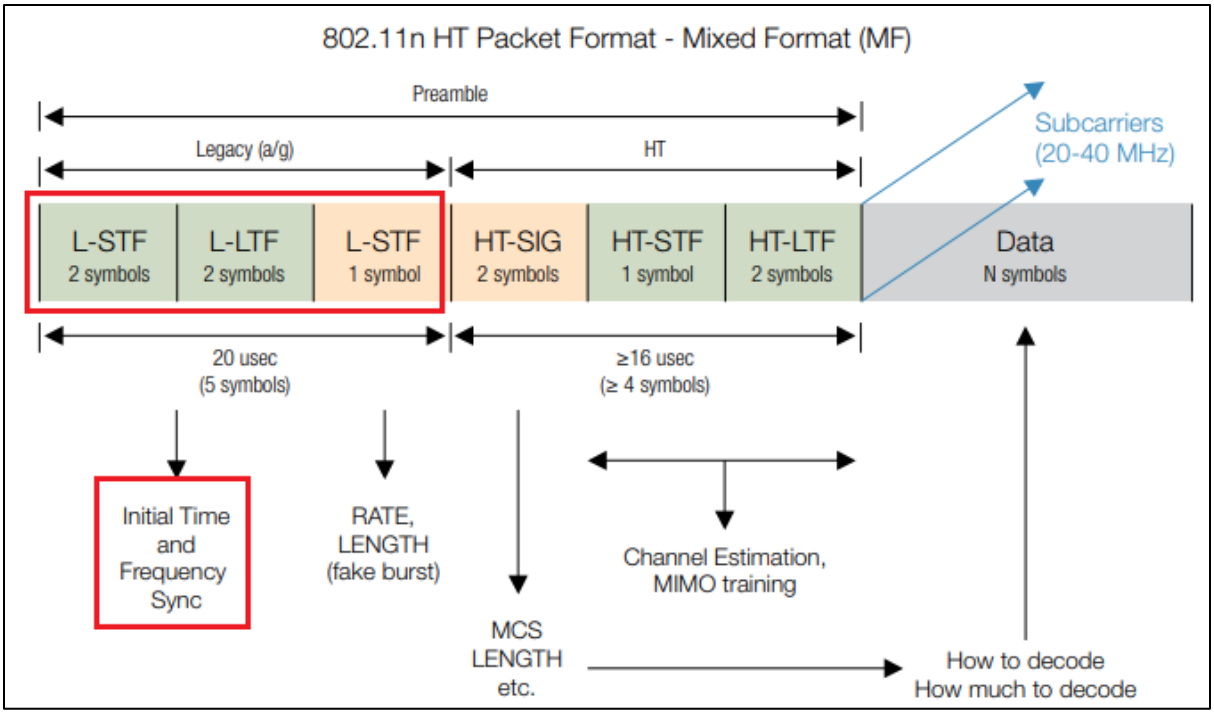
Figure 20-1—PPDU format

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

Table 20-4—Elements of the HT PLCP packet

Element	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
HT-SIG	HT SIGNAL field
HT-STF	HT Short Training field
HT-GF-STF	HT-Greenfield Short Training field
HT-LTF1	First HT Long Training field (Data)
HT-LTFs	Additional HT Long Training fields (Data and Extension)
Data	The Data field includes the PSDU

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)



(Source: https://www.cnrood.com/en/media/solutions/Wi-Fi_Overview_of_the_802.11_Physical_Layer.pdf)

23. The methods practiced by Epson's use of the accused products include producing a frame of data comprising a training symbol that includes a synchronization component that aids in synchronization, a plurality of data symbols, and a plurality of cyclic prefixes. For example, as part of the 802.11n standard, two preamble formats are defined for frames: HT-mixed format and HT-greenfield format. The non-HT and HT-mixed format preambles consist of training symbols, data symbols and guard intervals/cyclic prefixes, and the training symbols (L-STF and L-LTF fields) are and have been used for frame synchronization. Alternatively, on request from accused products, an 802.11 n/ac compliant WiFi access point can act as a transmitter and perform the step of producing a frame of data comprising a training symbol that includes a synchronization component that aids in synchronization, a plurality of data symbols, and a plurality of cyclic prefixes.

Two preamble formats are defined. For HT-mixed format operation, the preamble has a non-HT portion and an HT portion. The non-HT portion of the HT-mixed format preamble enables detection of the PPDU and acquisition of carrier frequency and timing by both HT STAs and STAs that are compliant with Clause 17 and/or Clause 19. The non-HT portion of the HT-mixed format preamble also consists of the SIGNAL field defined in Clause 17 and is thus decodable by STAs compliant with Clause 17 and Clause 19 as well as HT STAs.

The HT portion of the HT-mixed format preamble enables estimation of the MIMO channel to support demodulation of the HT data by HT STAs. The HT portion of the HT-mixed format preamble also includes the HT-SIG field, which supports HT operation. The SERVICE field is prepended to the PSDU.

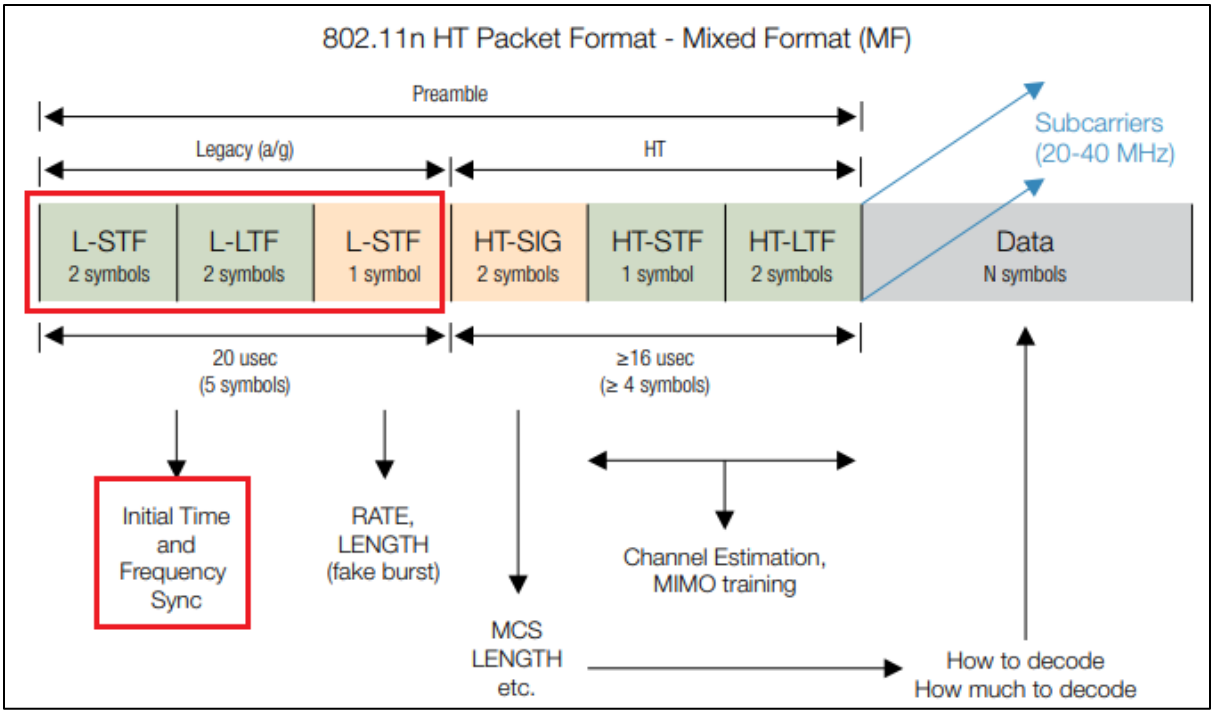
(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)



(Source: https://www.cnrood.com/en/media/solutions/Wi-Fi_Overview_of_the_802.11_Physical_Layer.pdf)

GI_TYPE	FORMAT is HT_MF or HT_GF	Indicates whether a short guard interval is used in the transmission of the packet. Enumerated type: LONG_GI indicates short GI is not used in the packet. SHORT_GI indicates short GI is used in the packet.	Y	Y
	Otherwise	Not present	N	N

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

24. The methods practiced by Epson's use of the accused products include transmitting the frame over a channel. The data frames containing the preambles are transmitted using one or more transmitting antennas. Alternatively, on request from an accused product, an 802.11 n/ac compliant WiFi access point can act as a transmitter and transmit the frame over a channel using one or more transmitting antennas.

20.3.9 HT preamble

20.3.9.1 Introduction

The HT preambles are defined in HT-mixed format and in HT-greenfield format to carry the required information to operate in a system with multiple transmit and multiple receive antennas.

In the HT-mixed format, to ensure compatibility with non-HT STAs, specific non-HT fields are defined so that they can be received by non-HT STAs compliant with Clause 17 or Clause 19 followed by the fields specific to HT STAs.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

20.3.10 Transmission of NON_HT format PPDUs with more than one antenna

When an HT device transmits a NON_HT format PPDU with the MODULATION parameter set to OFDM or ERP-OFDM using more than one transmit chain, it shall apply the cyclic shifts defined in Table 20-8 to the transmission in each chain.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

25. The methods practiced by Epson's use of the accused products include receiving the transmitted frame. For example, the receiving antennas of the accused products can receive the transmitted frames for further processing.

20.3.24 PLCP receive procedure

Typical PLCP receive procedures are shown in Figure 20-23 and Figure 20-24. The receive procedures correspond to HT-mixed format and HT-greenfield format, respectively. A typical state machine implementation of the receive PLCP is given in Figure 20-25. These receive procedures and state machine do not describe the operation of optional features, such as LDPC or STBC. If the detected format indicates a non-HT PPDU format, refer to the receive procedure and state machine in Clause 17 or Clause 19. Further, through station management (via the PLME), the PHY is set to the appropriate frequency, as specified in 20.4. Other receive parameters, such as RSSI and indicated DATARATE, may be accessed via the PHY-SAP.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

26. The methods practiced by Epson's use of the accused products include demodulating the received frame. For example, the received data frames are demodulated using the PLCP preambles.

20.3 HT PLCP sublayer

20.3.1 Introduction

A convergence procedure, in which PSDUs are converted to and from PPDUs, is provided for the HT PHY in 20.3. During transmission, the PSDU is processed (i.e., scrambled and coded) and appended to the PLCP preamble to create the PPDU. At the receiver, the PLCP preamble is processed to aid in demodulation and delivery of the PSDU.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

27. The methods practiced by Epson's use of the accused products include synchronizing the received demodulated frame to the transmitted frame such that the data symbols are synchronized in the time domain and frequency domain. For example, different fields of data like training symbols, cyclic prefixes and other signal bits are present in the received frame. The training symbols (L-STF and L-LTF fields) help in synchronizing the frame in both the time domain and frequency domain.

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station — **Page 2 of 2**

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors | Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
Focal Length 18.2 – 29.2 mm
Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
EXCEED YOUR VISION

Moverio BT-40S Smart Glasses

Smart Glasses

Display

Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller

Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform

OS Version Android™ 9

CPU and Memory

CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors

Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity

Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface

Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats

Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input

USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer

USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output

Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other

Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/QZSS/BDS
Firmware Update Supports (OTA)

General

Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box

Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language

OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/HU/TR/RU/AR/KK

Developer Resources

Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features

RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

a) Detect the start of frame.

b) Detect the transition from short sequences to channel estimation sequences, and establish fine timing (with one sample resolution).

c) Estimate the coarse and fine frequency offsets.

d) Derotate the frame according to estimated frequency offset.

e) Estimate the complex channel response coefficients for each of the subcarriers and each of the transmit chains.

f) For each of the data OFDM symbols, transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers in all spatial streams, derotate the subcarrier values according to estimated phase, group the results from all the receiver chains in each subcarrier to a vector, multiply the vector by a zero-forcing equalization matrix generated from the channel estimated during the channel estimation phase.

g) For each data-carrying subcarrier in each spatial stream, find the closest constellation point and compute the Euclidean distance from it.

h) Compute the average of the RMS of all errors in a frame. It is given by Equation (20-89).

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

17.3.2.1 Overview of the PPDU encoding process

The encoding process is composed of many detailed steps, which are described fully in later subclauses, as noted below. The following overview intends to facilitate understanding the details of the convergence procedure:

a) Produce the PLCP Preamble field, composed of 10 repetitions of a "short training sequence" (used for AGC convergence, diversity selection, timing acquisition, and coarse frequency acquisition in the receiver) and two repetitions of a "long training sequence" (used for channel estimation and fine frequency acquisition in the receiver), preceded by a guard interval (GI). Refer to 17.3.3 for details.

(Source: https://www.iith.ac.in/~tbr/teaching/docs/802.11-2007.pdf)

28. The methods practiced by Epson's use of the accused products include wherein the synchronizing in the time domain comprises coarse time synchronizing and fine time synchronizing. For example, the demodulation of PPDU frames also includes detecting training field bits and establishing a timing synchronization. This time synchronization would include both coarse and fine time synchronization. In general, coarse time synchronization is done using L-STF field and fine time synchronization is done using L-LTF field present in the preamble.

a) Detect the start of frame.

b) Detect the transition from short sequences to channel estimation sequences, and establish fine timing (with one sample resolution).

c) Estimate the coarse and fine frequency offsets.

d) Derotate the frame according to estimated frequency offset.

e) Estimate the complex channel response coefficients for each of the subcarriers and each of the transmit chains.

f) For each of the data OFDM symbols, transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers in all spatial streams, derotate the subcarrier values according to estimated phase, group the results from all the receiver chains in each subcarrier to a vector, multiply the vector by a zero-forcing equalization matrix generated from the channel estimated during the channel estimation phase.

g) For each data-carrying subcarrier in each spatial stream, find the closest constellation point and compute the Euclidean distance from it.

h) Compute the average of the RMS of all errors in a frame. It is given by Equation (20-89).

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

> The simplest packet is the one used when operating in the legacy mode, which has the same format as the packets used in 802.11a/g. The L-STF field, which stands for the *legacy-short training field*, consists of two augmented OFDM symbols of 4 μs duration each, and these are used by the receiver to perform time and frequency synchronization and to adjust its AGC. After the two L-STF augmented OFDM symbols, there is a second field called L-LTF, which stands for *legacy-long training field*, which is used to perform fine timing adjustments after the initial coarse acquisition in the L-STF field. The third field, called L-SIG, which stands for *legacy signal field*, contains data that tell the receiver what modulation and coding will be used in the data portion of the packet. The L-SIG field consists of one augmented OFDM symbol.

(Source: Introduction to MIMO Communications, Hampton, Jerry R. (2014))

> **Receive procedure**
>
> Typically, the receiver waits for a signal to exceed a threshold before initiating the packet reception procedure. The minimum requirement in 802.11a is to detect the start of a valid transmission received at a power level of at least −82 dBm within 4 μs with a probability greater than 90%. Due to competitive pressures, most products exceed this specification by 5–10 dB.
>
> The short training symbols are processed to set the AGC, initial frequency correction, and initial timing acquisition. This is followed by processing the long training symbols for fine frequency correction and fine timing adjustment. The LTF is also used to generate the channel estimate.

(Source: Next Generation Wireless LANs: 802.11n and 802.11ac, Perahia, Eldad and Stacey, Robert)

29. Epson has had actual knowledge of the '782 Patent at least as of the date when it was notified of the filing of this action. By the time of trial, Epson will have known and intended (since receiving such notice) that its continued actions would infringe and actively induce and contribute to the infringement of one or more claims of the '782 Patent.

30. Epson has also indirectly and willfully infringed, and continues to indirectly and willfully infringe, the '782 Patent, as explained further below in the "Additional Allegations Regarding Infringement" section.

31. American Patents has been damaged as a result of the infringing conduct by Epson alleged above. Thus, Epson is liable to American Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

32. American Patents has neither made nor sold unmarked articles that practice the '782 Patent, and is entitled to collect pre-filing damages for the full period allowed by law for infringement of the '782 Patent.

COUNT II

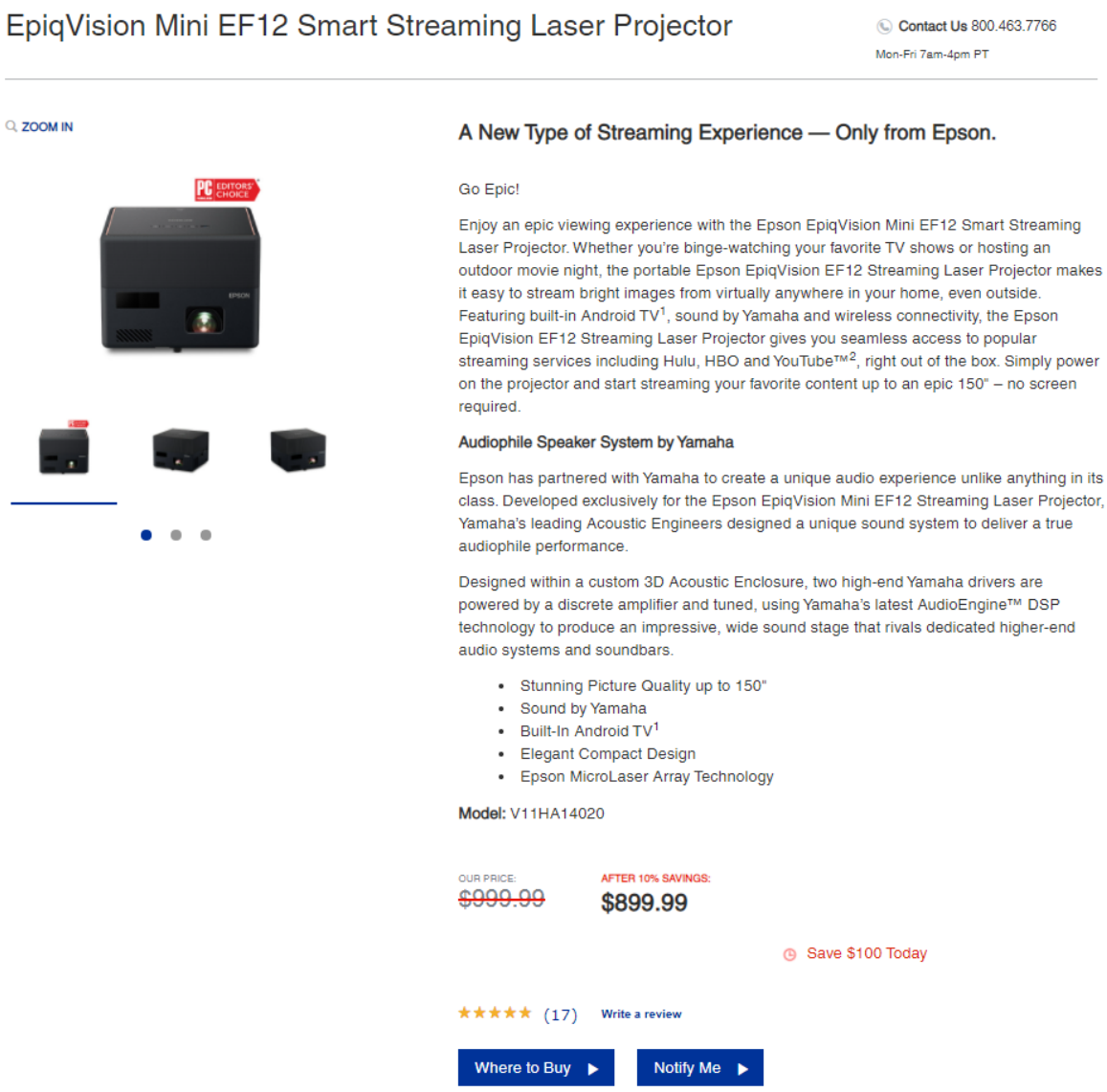
INFRINGEMENT OF U.S. PATENT NO. 7,310,304

33. On December 18, 2007, United States Patent No. 7,310,304 ("the '304 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Estimating Channel Parameters in Multi-Input, Multi-Output (MIMO) Systems."

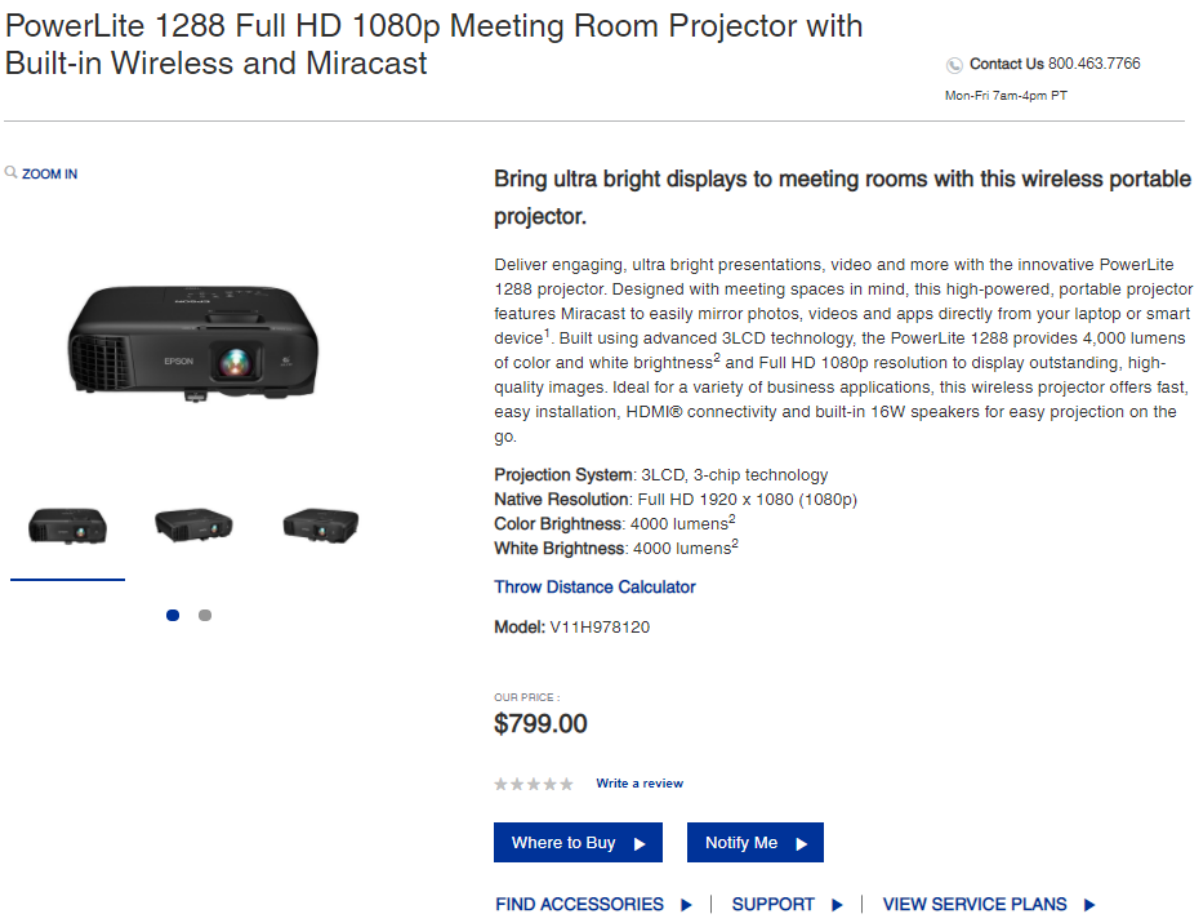
34. American Patents is the owner of the '304 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '304 Patent against infringers, and to collect damages for all relevant times.

35. Epson made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Epson EpiqVision Mini EF12 Smart Streaming Laser Projector, Epson PowerLite 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast, and Epson Moverio BT-40S Smart Glasses

with Intelligent Touch Controller families of products that include 802.11n and above capabilities ("accused products"):



(Source : https://epson.com/For-Work/Wearables/Smart-Glasses/Moverio-BT-350-Smart-Glasses/p/V11H837020)

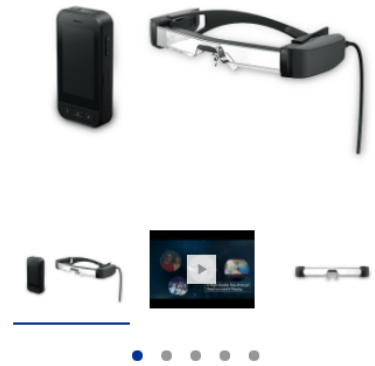


(Source : https://epson.com/For-Work/Projectors/Meeting-Room/PowerLite-1288-Full-HD-1080p-Meeting-Room-Projector-with-Built-in-Wireless-and-Miracast/p/V11H978120)

Moverio BT-40S Smart Glasses with Intelligent Touch Controller

Contact Us 800.463.7766
Mon-Fri 7am-4pm PT

ZOOM IN



See-through, AR glasses with smart touchscreen controller

Offering outstanding image quality and an intuitive touch controller, Epson Moverio BT-40S smart glasses take AR applications to the next level. Featuring innovative Si-OLED technology and dual-binocular displays – all in a comfortable design, they're the next generation of wearable, second-screen solutions.

The high-resolution display offers 1080p performance and a wide field of vision for stunning visual displays – to users, it's as if they're viewing a 120" screen from 16' away.

With a unique transparent display, Moverio BT-40S smart glasses allow you to keep an eye on your surroundings, even while viewing content. It's the perfect way to integrate digital information with the world around you.

Powered by the widely used Android™ 9.0 OS and certified by Google® Mobile Services, the included BO-IC400 touch controller offers an easy-to-use, open-platform interface. Equipped with a high-resolution, auto-focus camera, flashlight, proximity sensors and built-in audio, the BO-IC400 also offers pre-loaded productivity apps.

Combine the glasses with voice recognition technology over an active Internet connection for closed captioning or translation applications in movie theaters or classrooms . With a soft, flexible temple design, they're comfortable and easy for most anyone to wear, even over prescription glasses. And, they can be worn for long periods of time, with maximum comfort.

Whether used for subtitling, entertainment, museums or any other application, Moverio BT-40S smart glasses make it easy to enjoy a heads-up experience. And, with the intelligent controller, combined with the latest see-through optical technology, they're ideal for app developers looking to create new and innovative AR experiences.

- Full HD 1080p Si-OLED micro-projection technology
- 34° FOV, like looking at a 120" image from 15' away
- Transparent binocular displays
- Easy to wear with comfortable fit
- Simple user interface

Model: V11H969120

OUR PRICE :
$999.00

★★★★★ Write a review

Notify Me ▶

(Source : https://epson.com/For-Work/Wearables/Smart-Glasses/Moverio-BT-40S-Smart-Glasses-with-Intelligent-Touch-Controller-/p/V11H969120)

Wi-Fi CERTIFIED™ Certificate

This certificate lists the features that have successfully completed Wi-Fi Alliance interoperability testing. Learn more: www.wi-fi.org/certification/programs

Certification ID: WFA101028

Product Info

Date of Certification	July 8, 2020
Company	Seiko Epson Corporation
Product Name	Multimedia Projector[EF-12 series]
Product Model Variant	2020-07-08 (WFA101028 - 11359044)
Model Number	EF-12
Category	Computers & Accessories
Sub-category	Projector

Summary of Certifications

CLASSIFICATION	CERTIFICATION
Connectivity	2.4 GHz Spectrum Capabilities 5 GHz Spectrum Capabilities Wi-Fi CERTIFIED™ a Wi-Fi CERTIFIED™ ac Wi-Fi CERTIFIED™ b Wi-Fi CERTIFIED™ g Wi-Fi CERTIFIED™ n

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station — Page 2 of 2

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors | Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
Focal Length 18.2 – 29.2 mm
Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
EXCEED YOUR VISION

Moverio BT-40S Smart Glasses

Smart Glasses

Display

Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller
Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform
OS Version Android™ 9

CPU and Memory
CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors
Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity
Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface
Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats
Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input
USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer
USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output
Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other
Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/QZSS/BDS
Firmware Update Supports (OTA)

General
Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box
Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language
OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/HU/TR/RU/AR/KK

Developer Resources
Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features
RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

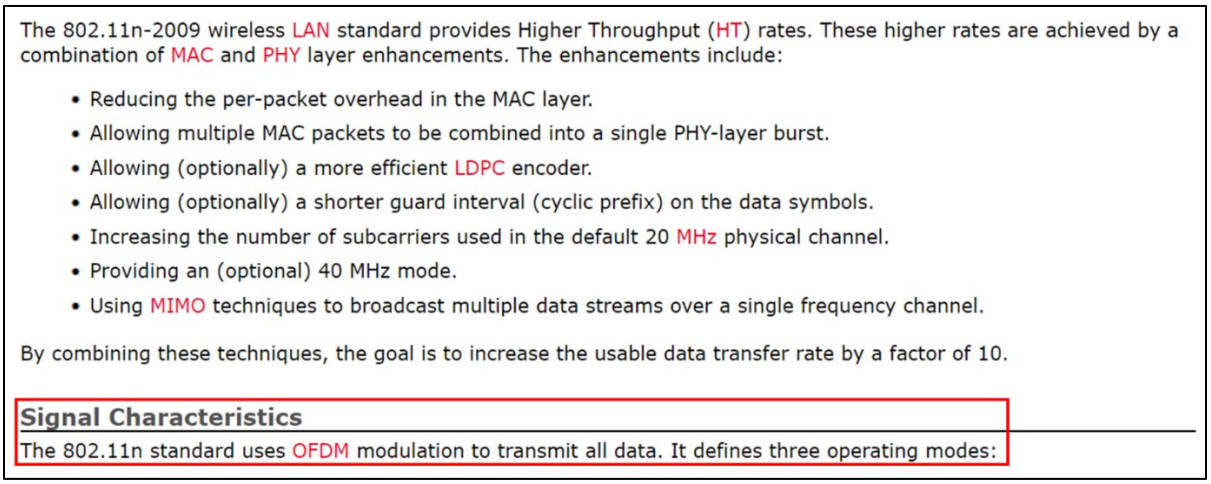
Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

36. By doing so, Epson has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 1 of the '304 Patent. Epson's infringement in this regard is ongoing.

37. Epson has infringed the '304 Patent by making, having made, using, importing, providing, supplying, distributing, selling or offering for sale products including an Orthogonal Frequency Division Multiplexing (OFDM) transmitter. For example, the accused products support IEEE 802.11 n/ac standards and MIMO technology. The IEEE 802.11n standard "uses OFDM modulation to transmit all data."



The 802.11n-2009 wireless LAN standard provides Higher Throughput (HT) rates. These higher rates are achieved by a combination of MAC and PHY layer enhancements. The enhancements include:

- Reducing the per-packet overhead in the MAC layer.
- Allowing multiple MAC packets to be combined into a single PHY-layer burst.
- Allowing (optionally) a more efficient LDPC encoder.
- Allowing (optionally) a shorter guard interval (cyclic prefix) on the data symbols.
- Increasing the number of subcarriers used in the default 20 MHz physical channel.
- Providing an (optional) 40 MHz mode.
- Using MIMO techniques to broadcast multiple data streams over a single frequency channel.

By combining these techniques, the goal is to increase the usable data transfer rate by a factor of 10.

Signal Characteristics

The 802.11n standard uses OFDM modulation to transmit all data. It defines three operating modes:

(Source: http://rfmw.em.keysight.com/wireless/helpfiles/89600b/webhelp/subsystems/wlan-mimo/Content/mimo_80211n_overview.htm)

38. The accused products include an encoder configured to process data to be transmitted within an OFDM system, the encoder further configured to separate the data onto one or more transmit diversity branches (TDBs). For example, the 802.11 ac standard is backwards compatible with 802.11n and 802.11a. Thus, if a device, such as an accused product, implements 802.11ac, then it also supports 802.11n and all previous versions of the WiFi standards (i.e., IEEE 802.11 a/b/g/n). According to the IEEE 802.11n standard, an encoder block is present in a transmitter section of general OFDM systems. The encoder(s) output(s) the data onto multiple transmit chains (transmit diversity branches) for further processing.

The introduction of 802.11ac expands the compatibility matrix in the 5 GHz band from two concurrently operating technologies to three, and the compatibility considerations in a broadcast network medium extend not only to intended receivers but to any receiver. Table 3-4 describes the compatibility between transmitters of frames and their intended receivers. That is, if a transmitter of the type in the left column sends a frame directed to a receiver of the type in any of the other three columns, what will the result be? One of the major methods used to support coexistence is backward compatibility. When built, 802.11ac devices will also incorporate 802.11a and 802.11n data rates, and thus will be able to send to older peers at older data rates.

(Source: 802.11ac: A Survival Guide: Wi-Fi at Gigabit and Beyond, Gast, Matthew S.)

Table 3-5. Compatibility between transmitters and listening devices

Transmitter type	802.11a listener	802.11n listener	802.11ac listener
802.11a	Designed operation	802.11n devices listen to 802.11a frames and defer medium access to avoid collisions	802.11ac devices listen to 802.11a frames and defer medium access to avoid collisions
802.11n	802.11n greenfield frames require RTS/CTS or CTS-to-self protection; 802.11n mixed-mode frames require no special protection	Designed operation	802.11ac devices listen to 802.11n frames and defer medium access to avoid collisions
802.11ac	802.11ac uses a compatible physical preamble, allowing 802.11a devices to read the medium as busy and avoid collisions	802.11ac uses a compatible preamble, allowing 802.11n devices to read the medium as busy and avoid collisions	Designed operation

(Source: 802.11ac: A Survival Guide: Wi-Fi at Gigabit and Beyond, Gast, Matthew S.)

20.3.3 Transmitter block diagram

HT-mixed format and HT-greenfield format transmissions can be generated using a transmitter consisting of of the following blocks:

a) *Scrambler* scrambles the data to reduce the probability of long sequences of zeros or ones; see 20.3.11.2.

b) *Encoder parser*, if BCC encoding is to be used, demultiplexes the scrambled bits among N_{ES} (number of BCC encoders for the Data field) BCC encoders, in a round robin manner.

c) *FEC encoders* encode the data to enable error correction. An FEC encoder may include a binary convolutional encoder followed by a puncturing device, or it may include an LDPC encoder.

d) *Stream parser* divides the outputs of the encoders into blocks that are sent to different interleaver and mapping devices. The sequence of the bits sent to an interleaver is called a *spatial stream*.

e) *Interleaver* interleaves the bits of each spatial stream (changes order of bits) to prevent long sequences of adjacent noisy bits from entering the BCC decoder. Interleaving is applied only when BCC encoding is used.

f) *Constellation mapper* maps the sequence of bits in each spatial stream to constellation points (complex numbers).

g) *STBC* encoder spreads constellation points from N_{SS} spatial streams into N_{STS} space-time streams using a space-time block code. STBC is used only when $N_{SS} < N_{STS}$; see 20.3.11.8.1.

h) *Spatial mapper* maps space-time streams to transmit chains. This may include one of the following:

1) *Direct mapping*: Constellation points from each space-time stream are mapped directly onto the transmit chains (one-to-one mapping).

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

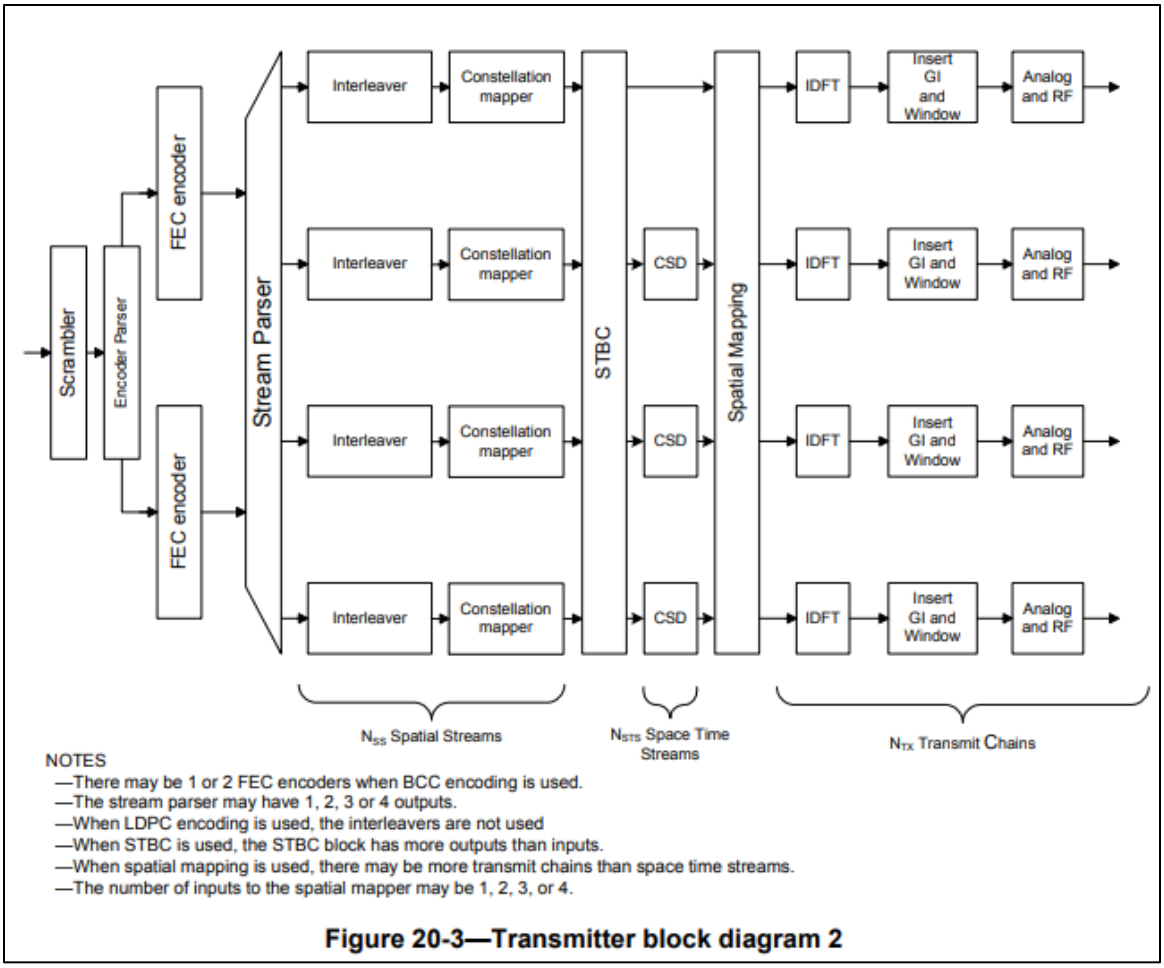


Figure 20-3—Transmitter block diagram 2

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

39. The accused products include one or more OFDM modulators, each OFDM modulator connected to a respective TDB, each OFDM modulator configured to produce a frame including a plurality of data symbols, a training structure, and cyclic prefixes inserted among the data symbols. For example, according to the IEEE 802.11n standard, a transmitter block would contain different functional blocks which include constellation mappers, IDFT stage, and Guard interval insertion. The constellation mapper maps the bits and the constellation points for different modulation schemes like QPSK, BPSK, 16-QAM, and 64-QAM. Hence, there would be modulator blocks for performing the modulation. After modulating the signal, it is converted

into the time domain and is transmitted as frames of data. These transmitted frames include a training structure, signal bits, cyclic prefixes and data bits.

20.3.3 Transmitter block diagram

HT-mixed format and HT-greenfield format transmissions can be generated using a transmitter consisting of of the following blocks:

a) *Scrambler* scrambles the data to reduce the probability of long sequences of zeros or ones; see 20.3.11.2.

b) *Encoder parser*, if BCC encoding is to be used, demultiplexes the scrambled bits among N_{ES} (number of BCC encoders for the Data field) BCC encoders, in a round robin manner.

c) *FEC encoders* encode the data to enable error correction. An FEC encoder may include a binary convolutional encoder followed by a puncturing device, or it may include an LDPC encoder.

d) *Stream parser* divides the outputs of the encoders into blocks that are sent to different interleaver and mapping devices. The sequence of the bits sent to an interleaver is called a *spatial stream*.

e) *Interleaver* interleaves the bits of each spatial stream (changes order of bits) to prevent long sequences of adjacent noisy bits from entering the BCC decoder. Interleaving is applied only when BCC encoding is used.

f) *Constellation mapper* maps the sequence of bits in each spatial stream to constellation points (complex numbers).

g) *STBC* encoder spreads constellation points from N_{SS} spatial streams into N_{STS} space-time streams using a space-time block code. STBC is used only when $N_{SS} < N_{STS}$; see 20.3.11.8.1.

h) *Spatial mapper* maps space-time streams to transmit chains. This may include one of the following:

1) *Direct mapping*: Constellation points from each space-time stream are mapped directly onto the transmit chains (one-to-one mapping).

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

The encoding process is composed of the steps described below. The following overview is intended to facilitate an understanding of the details of the convergence procedure:

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

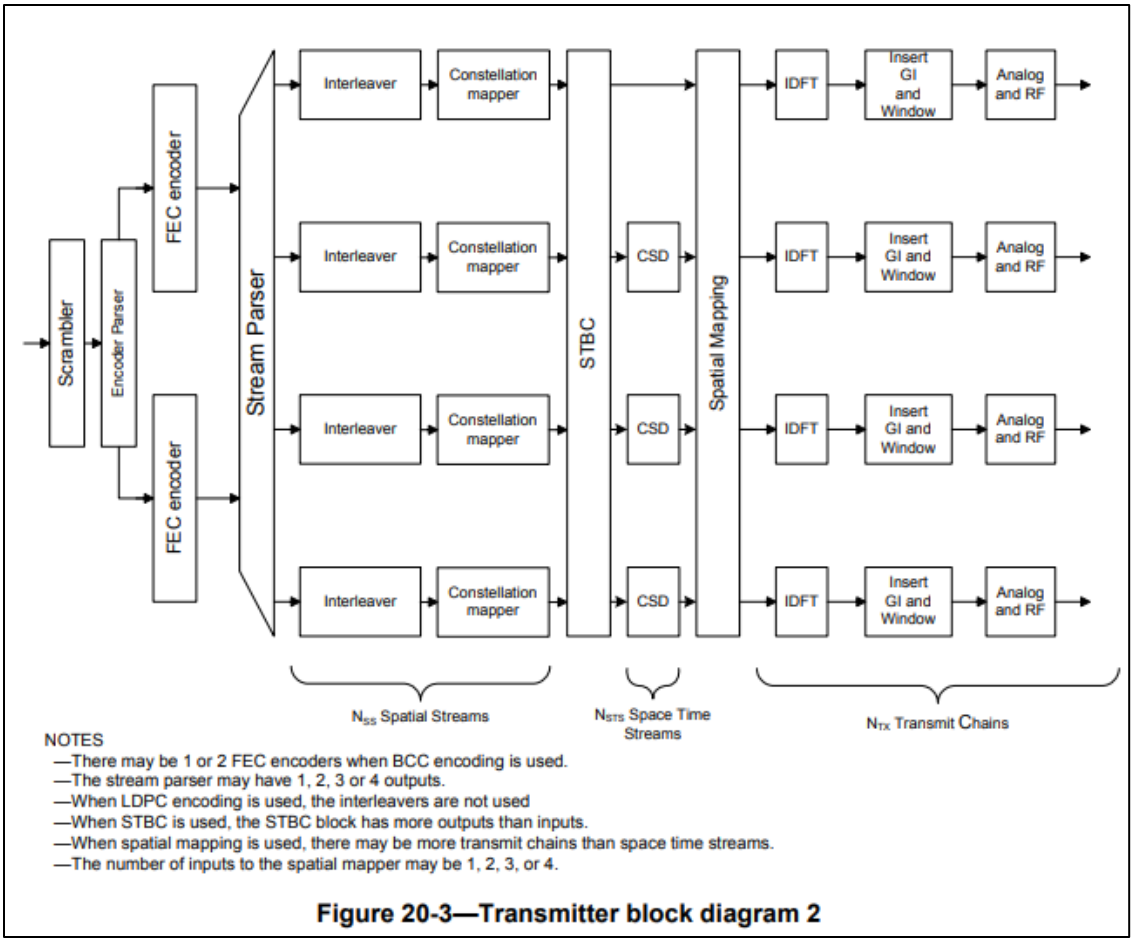


Figure 20-3—Transmitter block diagram 2

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

40. The accused products include one or more transmitting antennas in communication with the one or more OFDM modulators, respectively, each transmitting antenna configured to transmit the respective frame over a channel. The accused products support 802.11 a/b/g/n/ac WiFi standards and comprise one or more transmitting and one or more receiving antennas. These transmitting antennas transmit multiple OFDM frames with various signal fields over a channel. Thus, these transmitting antennas are connected to the OFDM modulators to obtain the OFDM frames for further transmission.

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station Page 2 of 2

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors | Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
Focal Length 18.2 – 29.2 mm
Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
EXCEED YOUR VISION

Moverio BT-40S Smart Glasses

Smart Glasses

Display

Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller

Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform

OS Version Android™ 9

CPU and Memory

CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors

Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity

Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface

Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats

Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input

USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer

USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output

Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other

Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/QZSS/BDS
Firmware Update Supports (OTA)

General

Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box

Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language

OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/HU/TR/RU/AR/KK

Developer Resources

Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features

RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

The 802.11n-2009 wireless LAN standard provides Higher Throughput (HT) rates. These higher rates are achieved by a combination of MAC and PHY layer enhancements. The enhancements include:

- Reducing the per-packet overhead in the MAC layer.
- Allowing multiple MAC packets to be combined into a single PHY-layer burst.
- Allowing (optionally) a more efficient LDPC encoder.
- Allowing (optionally) a shorter guard interval (cyclic prefix) on the data symbols.
- Increasing the number of subcarriers used in the default 20 MHz physical channel.
- Providing an (optional) 40 MHz mode.
- Using MIMO techniques to broadcast multiple data streams over a single frequency channel.

By combining these techniques, the goal is to increase the usable data transfer rate by a factor of 10.

Signal Characteristics

The 802.11n standard uses OFDM modulation to transmit all data. It defines three operating modes:

(Source: http://rfmw.em.keysight.com/wireless/helpfiles/89600b/webhelp/subsystems/wlan-mimo/Content/mimo_80211n_overview.htm)

20.3.4 Overview of the PPDU encoding process

The encoding process is composed of the steps described below. The following overview is intended to facilitate an understanding of the details of the convergence procedure:

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

41. The accused products include wherein the training structure of each frame includes a predetermined signal transmission matrix at a respective sub-channel, each training

structure adjusted to have a substantially constant amplitude in a time domain, and the cyclic prefixes are further inserted within the training symbol, and wherein the cyclic prefixes within the training symbol are longer than the cyclic prefixes among the data symbols, thereby countering an extended channel impulse response and improving synchronization performance. For example, a space time matrix is part of the data symbols and the training symbols in the transmission data. This data is transmitted over different antennas. The WiFi standards use guard intervals while transmitting frames to help the synchronization of frames at the receiver end. These guard intervals are of different lengths for the preamble and data symbols. The screenshots below show the Guard interval in the Long Training Field is 1.6 micro seconds, and the data field uses a Short guard interval of 0.4 micro seconds, so the cyclic prefix for the training symbols is longer than the cyclic prefix for data symbols. The training symbols (L-STF, HT-STF fields) in the 802.11n preamble have a constant amplitude in the time domain.

p) Map each of the complex numbers in each of the N_{ST} subcarriers in each of the OFDM symbols in each of the N_{STS} space-time streams to the N_{TX} transmit chain inputs. For direct-mapped operation, $N_{TX} = N_{STS}$, and there is a one-to-one correspondence between space-time streams and transmit chains. In this case, the OFDM symbols associated with each space-time stream are also associated with the corresponding transmit chain. Otherwise, a spatial mapping matrix associated with each OFDM subcarrier, as indicated by the EXPANSION_MAT parameter of the TXVECTOR, is used to perform a linear transformation on the vector of N_{STS} complex numbers associated with each subcarrier in each OFDM symbol. This spatial mapping matrix maps the vector of N_{STS} complex numbers in each subcarrier into a vector of N_{TX} complex numbers in each subcarrier. The sequence of N_{ST} complex numbers associated with each transmit chain (where each of the N_{ST} complex numbers is taken from the same position in the N_{TX} vector of complex numbers across the N_{ST} subcarriers associated with an OFDM symbol) constitutes an OFDM symbol associated with the corresponding transmit chain. For details, see 20.3.11.10. Spatial mapping matrices may include cyclic shifts, as described in 20.3.11.10.1.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

T_{DFT}: IDFT/DFT period	3.2 µs	3.2 µs	3.2 µs
T_{GI}: Guard interval duration	0.8 µs= T_{DFT}/4	0.8 µs	0.8 µs
T_{GI2}: Double guard interval	1.6 µs	1.6 µs	1.6 µs
T_{GIS}: Short guard interval duration	N/A	0.4 µs = T_{DFT}/8	0.4 µs See NOTE 2
$T_{L\text{-}STF}$: Non-HT short training sequence duration	8 µs=10× T_{DFT}/4	8 µs	8 µs
$T_{HT\text{-}GF\text{-}STF}$: HT-greenfield short training field duration	N/A	8 µs=10× T_{DFT}/4	8 µs See NOTE 2
$T_{L\text{-}LTF}$: Non-HT long training field duration	8 µs=2× T_{DFT}+T_{GI2}	8 µs	8 µs
T_{SYM}: Symbol interval	4 µs= T_{DFT}+T_{GI}	4 µs	4 µs
T_{SYMS}: Short GI symbol interval	N/A	3.6 µs = T_{DFT}+T_{GIS}	3.6 µs See NOTE 2

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

STBC	2	Set to a nonzero number, to indicate the difference between the number of space-time streams (N_{STS}) and the number of spatial streams (N_{SS}) indicated by the MCS. Set to 00 to indicate no STBC (N_{STS} = N_{SS}). See NOTE 1.
FEC coding	1	Set to 1 for LDPC. Set to 0 for BCC.
Short GI	1	Set to 1 to indicate that the short GI is used after the HT training. Set to 0 otherwise.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

20.3.11.10.5 Transmission with a short GI

Short GI is used in the data field of the packet when the Short GI field in the HT-SIG is set to 1. When it is used, the same formula for the formation of the signal shall be used as in 20.3.11.10.2, 20.3.11.10.3, and 20.3.11.10.4, with T_{GI} replaced by T_{GIS} and T_{SYM} replaced by T_{SYMS}.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

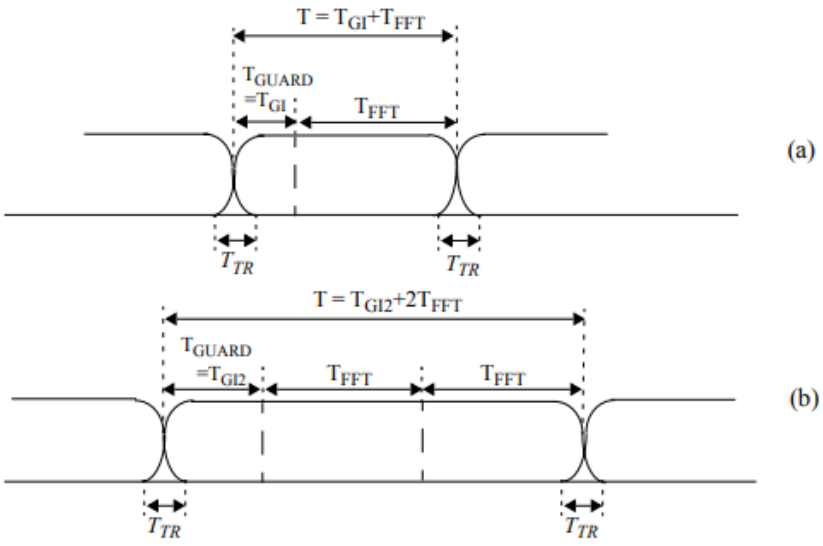
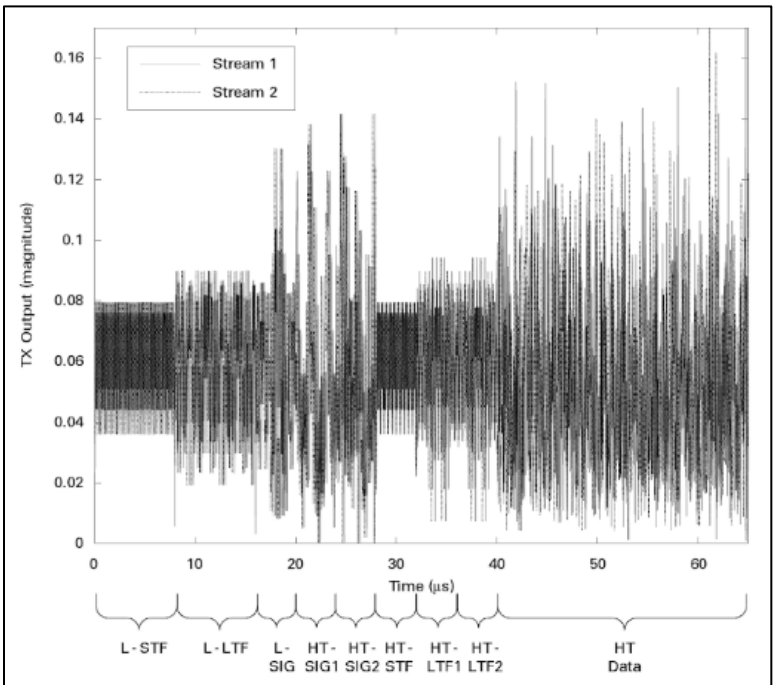


Figure 108—Illustration of OFDM frame with cyclic extension and windowing for (a) single reception or (b) two receptions of the FFT period

(Source: http://www.ahltek.com/WhitePaperspdf/802.11-20%20specs/802.11a-1999.pdf)



802.11n MF with two spatial streams.

(Source: Next Generation Wireless LANs: 802.11n and 802.11ac, Perahia, Eldad and Stacey, Robert)

42. Epson has had actual knowledge of the '304 Patent at least as of the date when it was notified of the filing of this action. By the time of trial, Epson will have known and intended (since receiving such notice) that its continued actions would infringe and actively induce and contribute to the infringement of one or more claims of the '304 Patent.

43. Epson has also indirectly and willfully infringed, and continues to indirectly and willfully infringe, the '304 Patent, as explained further below in the "Additional Allegations Regarding Infringement" section.

44. American Patents has been damaged as a result of the infringing conduct by Epson alleged above. Thus, Epson is liable to American Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

45. American Patents has neither made nor sold unmarked articles that practice the '304 Patent, and is entitled to collect pre-filing damages for the full period allowed by law for infringement of the '304 Patent.

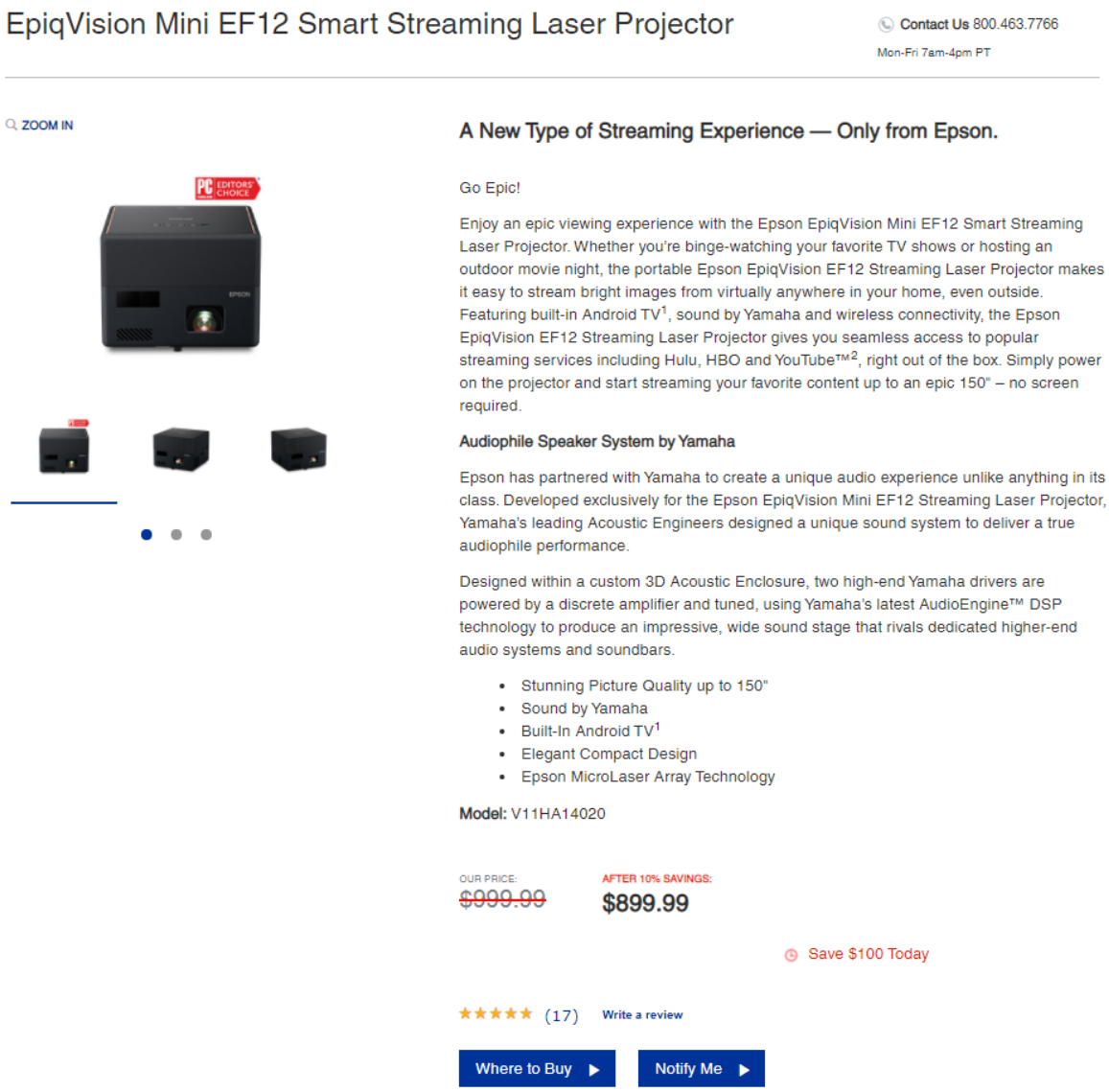
COUNT III

INFRINGEMENT OF U.S. PATENT NO. 7,706,458

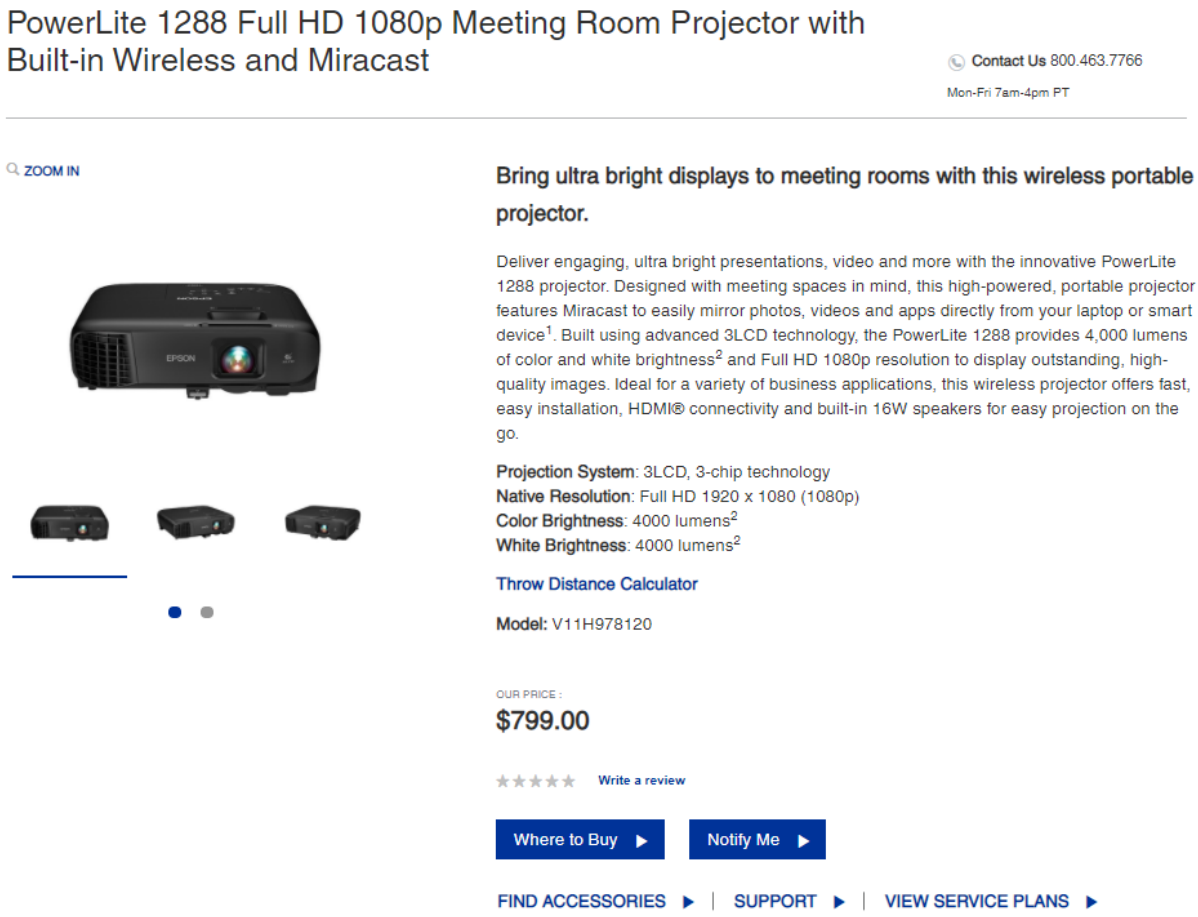
46. On April 27, 2010, United States Patent No. 7,706,458 ("the '458 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Time And Frequency Synchronization In Multi-Input, Multi-Output (MIMO) Systems."

47. American Patents is the owner of the '458 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '458 Patent against infringers, and to collect damages for all relevant times.

48. Epson made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Epson EpiqVision Mini EF12 Smart Streaming Laser Projector, Epson PowerLite 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast, and Epson Moverio BT-40S Smart Glasses with Intelligent Touch Controller families of products that include 802.11n and above capabilities ("accused products"):



(Source : https://epson.com/For-Work/Wearables/Smart-Glasses/Moverio-BT-350-Smart-Glasses/p/V11H837020)

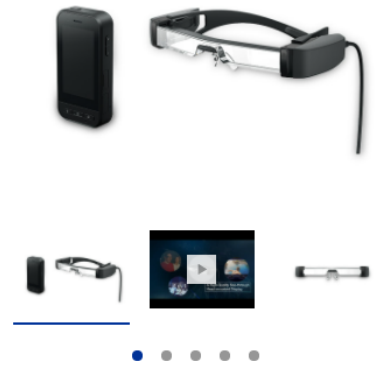


(Source : https://epson.com/For-Work/Projectors/Meeting-Room/PowerLite-1288-Full-HD-1080p-Meeting-Room-Projector-with-Built-in-Wireless-and-Miracast/p/V11H978120)

Moverio BT-40S Smart Glasses with Intelligent Touch Controller

Contact Us 800.463.7766
Mon-Fri 7am-4pm PT

ZOOM IN



See-through, AR glasses with smart touchscreen controller

Offering outstanding image quality and an intuitive touch controller, Epson Moverio BT-40S smart glasses take AR applications to the next level. Featuring innovative Si-OLED technology and dual-binocular displays – all in a comfortable design, they're the next generation of wearable, second-screen solutions.

The high-resolution display offers 1080p performance and a wide field of vision for stunning visual displays – to users, it's as if they're viewing a 120" screen from 16' away.

With a unique transparent display, Moverio BT-40S smart glasses allow you to keep an eye on your surroundings, even while viewing content. It's the perfect way to integrate digital information with the world around you.

Powered by the widely used Android™ 9.0 OS and certified by Google® Mobile Services, the included BO-IC400 touch controller offers an easy-to-use, open-platform interface. Equipped with a high-resolution, auto-focus camera, flashlight, proximity sensors and built-in audio, the BO-IC400 also offers pre-loaded productivity apps.

Combine the glasses with voice recognition technology over an active Internet connection for closed captioning or translation applications in movie theaters or classrooms . With a soft, flexible temple design, they're comfortable and easy for most anyone to wear, even over prescription glasses. And, they can be worn for long periods of time, with maximum comfort.

Whether used for subtitling, entertainment, museums or any other application, Moverio BT-40S smart glasses make it easy to enjoy a heads-up experience. And, with the intelligent controller, combined with the latest see-through optical technology, they're ideal for app developers looking to create new and innovative AR experiences.

- Full HD 1080p Si-OLED micro-projection technology
- 34° FOV, like looking at a 120" image from 15' away
- Transparent binocular displays
- Easy to wear with comfortable fit
- Simple user interface

Model: V11H969120

OUR PRICE :
$999.00

★★★★★ Write a review

Notify Me ▶

(Source : https://epson.com/For-Work/Wearables/Smart-Glasses/Moverio-BT-40S-Smart-Glasses-with-Intelligent-Touch-Controller-/p/V11H969120)

Wi-Fi CERTIFIED™ Certificate

This certificate lists the features that have successfully completed Wi-Fi Alliance interoperability testing. Learn more: www.wi-fi.org/certification/programs

Certification ID: WFA101028

Product Info

Date of Certification	July 8, 2020
Company	Seiko Epson Corporation
Product Name	Multimedia Projector[EF-12 series]
Product Model Variant	2020-07-08 (WFA101028 - 11359044)
Model Number	EF-12
Category	Computers & Accessories
Sub-category	Projector

Summary of Certifications

CLASSIFICATION	CERTIFICATION
Connectivity	2.4 GHz Spectrum Capabilities 5 GHz Spectrum Capabilities Wi-Fi CERTIFIED™ a Wi-Fi CERTIFIED™ ac Wi-Fi CERTIFIED™ b Wi-Fi CERTIFIED™ g Wi-Fi CERTIFIED™ n

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station Page 2 of 2

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors | Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
Focal Length 18.2 – 29.2 mm
Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
EXCEED YOUR VISION

Moverio BT-40S Smart Glasses

Smart Glasses

Display

Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller

Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform

OS Version Android™ 9

CPU and Memory

CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors

Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity

Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface

Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats

Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input

USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer

USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output

Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other

Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/QZSS/BDS
Firmware Update Supports (OTA)

General

Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box

Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language

OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/HU/TR/RU/AR/KK

Developer Resources

Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features

RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

49. By doing so, Epson has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 1 of the '458 Patent. Epson's infringement in this regard is ongoing.

50. Epson has infringed the '458 Patent by making, having made, using, importing, providing, supplying, distributing, selling or offering for sale products including an apparatus for synchronizing a communication system. For example, the accused products can act and have acted as a receiver in an apparatus for synchronizing a communication system. An 802.11 n/ac compliant WiFi access point that is communicating with an accused product can be part of the apparatus, acting as a transmitter. The accused products support IEEE 802.11 n/ac standards and MIMO technology. The IEEE 802.11ac standard is backwards compatible with the 802.11n standard. If a device such as an accused product complies with IEEE 802.11ac, it also complies with IEEE 802.11n and all prior versions of the WiFi standards (802.11 a/b/g/n). According to the 802.11a standard, the physical layer services include an OFDM system. According to the IEEE 802.11n standard, all Protocol Data Unit (PPDU) frame formats have training fields and signaling fields which would help in synchronizing the communication system.

> The introduction of 802.11ac expands the compatibility matrix in the 5 GHz band from two concurrently operating technologies to three, and the compatibility considerations in a broadcast network medium extend not only to intended receivers but to any receiver. Table 3-4 describes the compatibility between transmitters of frames and their intended receivers. That is, if a transmitter of the type in the left column sends a frame directed to a receiver of the type in any of the other three columns, what will the result be? One of the major methods used to support coexistence is backward compatibility. When built, 802.11ac devices will also incorporate 802.11a and 802.11n data rates, and thus will be able to send to older peers at older data rates.

(Source: 802.11ac: A Survival Guide: Wi-Fi at Gigabit and Beyond, Gast, Matthew S.)

Table 3-5. Compatibility between transmitters and listening devices

Transmitter type	802.11a listener	802.11n listener	802.11ac listener
802.11a	Designed operation	802.11n devices listen to 802.11a frames and defer medium access to avoid collisions	802.11ac devices listen to 802.11a frames and defer medium access to avoid collisions
802.11n	802.11n greenfield frames require RTS/CTS or CTS-to-self protection; 802.11n mixed-mode frames require no special protection	Designed operation	802.11ac devices listen to 802.11n frames and defer medium access to avoid collisions
802.11ac	802.11ac uses a compatible physical preamble, allowing 802.11a devices to read the medium as busy and avoid collisions	802.11ac uses a compatible preamble, allowing 802.11n devices to read the medium as busy and avoid collisions	Designed operation

(Source: 802.11ac: A Survival Guide: Wi-Fi at Gigabit and Beyond, Gast, Matthew S.)

17.1.1 Scope

This subclause describes the PHY services provided to the IEEE 802.11 wireless LAN MAC by the 5 GHz (bands) OFDM system. The OFDM PHY layer consists of two protocol functions, as follows:

a) A PHY convergence function, which adapts the capabilities of the physical medium dependent (PMD) system to the PHY service. This function is supported by the physical layer convergence procedure (PLCP), which defines a method of mapping the IEEE 802.11 PHY sublayer service data units (PSDU) into a framing format suitable for sending and receiving user data and management information between two or more stations using the associated PMD system.

b) A PMD system whose function defines the characteristics and method of transmitting and receiving data through a wireless medium between two or more stations, each using the OFDM system.

(Source: https://standards.ieee.org/standard/802_11a-1999.html)

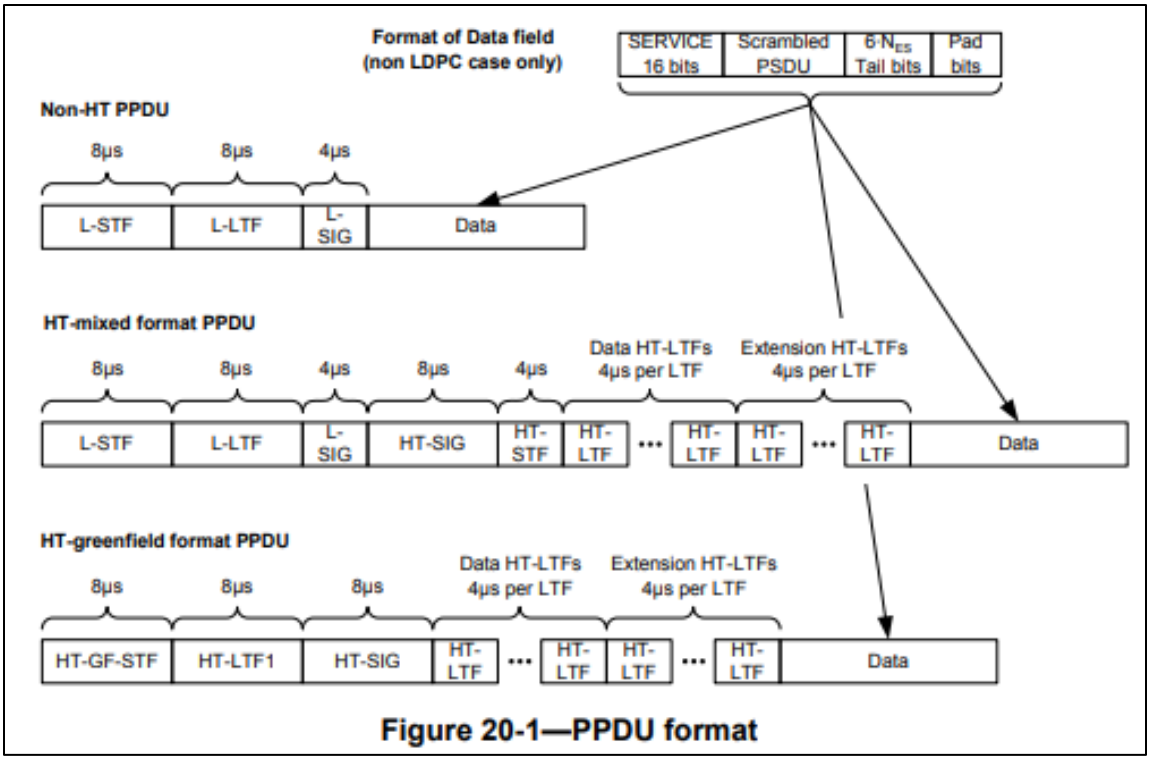


Figure 20-1—PPDU format

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

The fields of the VHT PPDU format are summarized in Table 22-4.

Table 22-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carries the PSDU(s)

(Source: https://ieeexplore.ieee.org/document/7797535/)

51. The accused products include a number (Q) of Orthogonal Frequency Division Multiplexing (OFDM) modulators, each OFDM modulator producing a frame having at least one

inserted symbol, a plurality of data symbols, and cyclic prefixes. According to the IEEE 802.11n standard, a transmitter block contains different functional blocks which include, but are not limited to, constellation mappers, IDFT stage, and Guard interval insertion. Constellation mappers map the bits and the constellation points for different modulation schemes like QPSK, BPSK, 16-QAM, 64-QAM. After modulating the signal, it is converted into time domain and is transmitted as frames of data. These transmitted frames include training field bits, signal bits, cyclic prefixes and data bits. Alternatively, on request from an accused product, an 802.11 n/ac compliant WiFi access point can act as a transmitter that includes a number (Q) of OFDM modulators, each OFDM modulator producing a frame having at least one inserted symbol, a plurality of data symbols, and cyclic prefixes.

20.3.3 Transmitter block diagram

HT-mixed format and HT-greenfield format transmissions can be generated using a transmitter consisting of of the following blocks:

a) *Scrambler* scrambles the data to reduce the probability of long sequences of zeros or ones; see 20.3.11.2.

b) *Encoder parser*, if BCC encoding is to be used, demultiplexes the scrambled bits among N_{ES} (number of BCC encoders for the Data field) BCC encoders, in a round robin manner.

c) *FEC encoders* encode the data to enable error correction. An FEC encoder may include a binary convolutional encoder followed by a puncturing device, or it may include an LDPC encoder.

d) *Stream parser* divides the outputs of the encoders into blocks that are sent to different interleaver and mapping devices. The sequence of the bits sent to an interleaver is called a *spatial stream*.

e) *Interleaver* interleaves the bits of each spatial stream (changes order of bits) to prevent long sequences of adjacent noisy bits from entering the BCC decoder. Interleaving is applied only when BCC encoding is used.

f) *Constellation mapper* maps the sequence of bits in each spatial stream to constellation points (complex numbers).

g) *STBC* encoder spreads constellation points from N_{SS} spatial streams into N_{STS} space-time streams using a space-time block code. STBC is used only when $N_{SS} < N_{STS}$; see 20.3.11.8.1.

h) *Spatial mapper* maps space-time streams to transmit chains. This may include one of the following:

   1) *Direct mapping*: Constellation points from each space-time stream are mapped directly onto the transmit chains (one-to-one mapping).

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

The encoding process is composed of the steps described below. The following overview is intended to facilitate an understanding of the details of the convergence procedure:

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

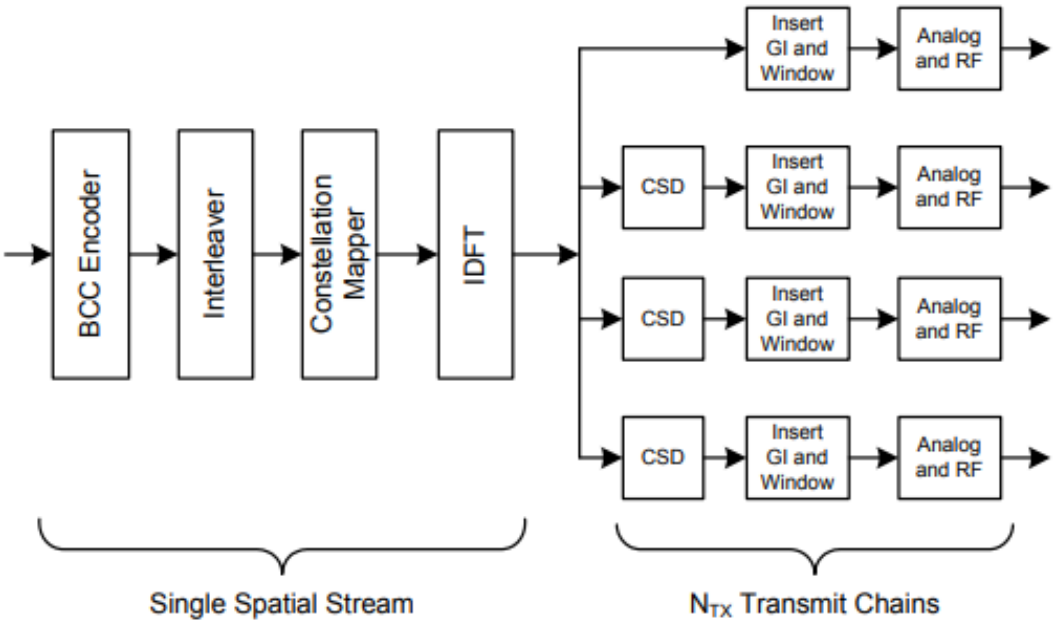


Figure 20-2—Transmitter block diagram 1

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

52. The accused products include Q transmitting antennas, each transmitting antenna connected to a respective OFDM modulator, the transmitting antennas configured to transmit a respective frame over a channel. The accused products support MIMO and comply with IEEE 802.11 a/b/g/n/ac standards. The transmitting antennas transmit multiple OFDM frames over a channel. The transmitting antennas are connected to OFDM modulators to transmit the OFDM frames over a channel. Alternatively, on request from an accused product, a WiFi access point acts as a device that includes Q transmitting antennas, each transmitting antenna connected to a respective OFDM modulator, the transmitting antennas configured to transmit a respective frame over a channel.

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station — **Page 2 of 2**

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors | Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
Focal Length 18.2 – 29.2 mm
Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
EXCEED YOUR VISION

Moverio BT-40S Smart Glasses

Smart Glasses

Display

Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller

Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform

OS Version Android™ 9

CPU and Memory

CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors

Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity

Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/ PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface

Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats

Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input

USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer

USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output

Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other

Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/ QZSS/BDS
Firmware Update Supports (OTA)

General

Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box

Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language

OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/ HU/TR/RU/AR/KK

Developer Resources

Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features

RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

20.3.4 Overview of the PPDU encoding process

The encoding process is composed of the steps described below. The following overview is intended to facilitate an understanding of the details of the convergence procedure:

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

53. The accused products include a number (L) of receiving antennas for receiving the transmitted frames. For example, the accused products support MIMO and comply with 802.11 a/b/g/n/ac WiFi standards. The receiving antennas receive the transmitted frames.

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station — **Page 2 of 2**

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

EPSON
EXCEED YOUR VISION

PowerLite® 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast®

Projectors | Business

Specifications

Projection System 3LCD, 3-chip technology
Projection Method Front/rear/ceiling mount
Driving Method Poly-silicon TFT Active Matrix
Pixel Number 2,073,600 dots (1920 x 1080) x 3
Color Brightness[2] Color Light Output: 4,000 lumens
White Brightness[2] White Light Output: 4,000 lumens
Aspect Ratio 16:9
Native Resolution 1920 x 1080
Resize Support 800 x 600 (SVGA), 1024 x 768 (XGA), 1152 x 864 (SXGA), 1280 x 800 (WXGA), 1280 x 960 (SXGA2), 1280 x 1024 (SXGA3), 1440 x 900 (WXGA+), 1400 x 1050 (SXGA+), 1600 x 900 (WXGA++), 1680 x 1050 (WSXGA+)
Lamp Type 230 W UHE
Lamp Life[4]
Normal Mode: Up to 5,500 hours
ECO Mode: Up to 12,000 hours
Throw Ratio Range 1.32 (Zoom:Wide), 2.14 (Zoom:Tele)
Size (Projected Distance) 30" – 300" (0.9 – 9 m)
Keystone Correction (Auto) Vertical: ± 30 degrees
Keystone Correction (Manual) Horizontal: ± 30 degrees (Easy-Slide Horizontal Image Correction)
USB Plug 'n Play Projects audio and video, PC and Mac® compatible
Contrast Ratio Up to 16,000:1
Color Reproduction Over 1.07 billion colors

Projection Lens

Type Optical zoom (Manual)/Focus (Manual)
F-number 1.51 – 1.99
Focal Length 18.2 – 29.2 mm
Zoom Ratio Optical zoom 1.0 – 1.6

Other

Display Performance NTSC: 480 lines; PAL: 576 lines (Depends on observation of the multi-burst pattern)
Input Signal NTSC/NTSC4.43/PAL/M-PAL/N-PAL/PAL60/SECAM
Speaker 16 W
Operating Temperature 41 ˚ to 104 ˚F (5 ˚ to 40 ˚C)
Power Supply Voltage 100 – 240 V ±10%, 50/60 Hz
Power Consumption
Normal Mode: 345 W
ECO Mode: 235 W
Fan Noise
Normal Mode: 37 dB
ECO Mode: 28 dB
Security Password Protect function

Interfaces

2x HDMI
Computer/component video: 1x D-sub 15 pin
Composite video: 1x RCA (Yellow)
Audio in: 1x RCA (White/Red)
1x USB connector Type A: PC-free USB and other
1x USB connector Type B: USB Plug 'n Play

Dimensions (W x D x H)

Including Feet 12.2" x 11.5" x 4.1"
Excluding Feet 12.2" x 11.1" x 3.5"
Weight 6.83 lb

Remote Control

Features Source search selection, power, volume, e-zoom, A/V mute, freeze, menu, page up and down, help, auto, mouse functions
Operating Angle
Right/left: ± 30 degrees
Upper/lower: +15 degrees
Operating Distance 19.7 ft (6 m)

Wireless (Wireless LAN)

Supported Speeds
IEEE 802.11b (2.4GHz): 11 Mbps*
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 72.2 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 150.0 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Mode Infrastructure, Access Point
Frequency Type (Modulations) 802.11b/g/n (2.4 GHz) (DSSS/CCK, OFDM) 802.11a/n (5GHz) (OFDM)

Wireless (Miracast)

Supported Speeds
IEEE 802.11g (2.4GHz): 54 Mbps*
IEEE 802.11n (2.4GHz): 130.0 Mbps*
IEEE 802.11a (5GHz): 54 Mbps*
IEEE 802.11n (5GHz): 270.0 Mbps*
IEEE 802.11ac (5GHz): 780 Mbps*
*These modes and actual data throughputs depend on supported wireless mode of source devices and/or environmental conditions.
Supported Connection Mode Wi-Fi Direct®[6]
Certification Wi-Fi CERTIFIED™ Miracast
Frequency Type OFDM, MIMO-OFDM

Eco Features

RoHS compliant
Recyclable product[7]
Epson America, Inc. is a SmartWay® Transport Partner[8]

Support

Epson Connection℠
Pre-sales support: U.S. and Canada 800-463-7766
Internet website: www.epson.com
Service Programs 1-year projector limited warranty, Epson Road Service program, PrivateLine® dedicated toll-free support and 90-day limited lamp warranty

What's in the Box

PowerLite 1288 projector, power cable, computer cable (VGA), soft carrying case, projector remote control, batteries, Quick Setup Sheet

Ordering Information

(Source :

https://mediaserver.goepson.com/ImConvServlet/imconv/ea07add1b62aa56ea948796f4feb479a84d2c8bf/original?assetDescr=PowerLite-1288-Projector_Specification-Sheet-CPD-59278)

EPSON
EXCEED YOUR VISION

Moverio BT-40S Smart Glasses

Smart Glasses

Display
Headset
Display Device Type Si-OLED (Silicon-Organic Light-Emitting Diode)
Brightness 1000 cd/m² (MAX)
Contrast 500,000: 1
Transmittance
Headset 40%
Shade 2%
Display Size 0.453"-wide panel
Pixel Number 2,073,600 pixels (1920x1080xRGB)
Refresh Rate 60 Hz
Field of View 34 degrees (diagonal)
Screen Size (Projected Distance) 120" at 5 m
Color Reproduction 24-bit color (16.77 million colors)

Controller
Display Device Type IPS LCD
Brightness 330 cd/m² (MAX)
Contrast 800:1
Display Size 2.95"-wide panel
Pixel Number 409,920 pixels (480x854xRGB)
Refresh Rate 60 Hz
Color Reproduction 24-bit color (16.77 million colors)

Platform
OS Version Android™ 9

CPU and Memory
CPU Qualcomm SXR1130
Memory 4GB
Storage 64GB
External Memory microSD (2 GB maximum), microSDHC* (32 GB maximum), microSDXC (2 TB maximum)

Sensors
Camera 13MP Auto Focus, in Controller
GPS Yes, in Controller
Compass Yes, 9-axis in both Headset and Controller
Gyroscope Yes, 9-axis in both Headset and Controller
Accelerometer Yes, 9-axis in both Headset and Controller
Ambient Light Sensor Yes, in both Headset and Controller
Proximity Sensor Yes, in Controller

Connectivity
Wireless LAN IEEE 802.11 a/b/g/n/ac, 2x2 Dual Band
Bluetooth®
Version: 5.0
Profile: Bluetooth Classic (A2DP 1.3/AVRCP 1.3/HSP 1.2/HID 1.0/ PAN PANU/PAN NAP/OPP1.2.1/SPP), Bluetooth LE (SCPP/HOGP)
USB
Bottom Port: USB Type-C DP Alt, USB 2.0, USB 3.0
Side Port: USB 2.0
Audio 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

User Interface
Touch Panel
Operation Keys Power button, Volume keys, BACK key, HOME key, History key, Function key

Supported File Formats
Video MPEG-2, MPEG-4, H.263, H.264, H.265 (HEVC), VP8, VP9
Audio AAC, HE-AAC, AMR, FLAC, MP3 (8 to 320 kbps) CBR/VBR, Vorbis, WAV, Opus

Video Input
USB Type-C
Video I/F: DisplayPort Alternate Mode (DP Alt Mode)
DisplayPort: Version 1.2
Resolution: 1080p FHD/60 Hz
EDID: Supported
HDCP: Supported

Data Transfer
USB Type-C
USB Protocol: USB 2.0
Data Type: Sensor data, Headset API control, firmware update
Device Class for Sensor: UAC 2.0

Sound Input/Output
Headset
Audio 3.5 mm audio jack (CTIA standard earphones with microphone compatible)
Audio Output
Impedance: Over 16Ω
Controller
Audio Microphone, Receiver, Speaker (0.5 W), 3.5 mm Audio Jack (CTIA standard earphones with microphone compatible)

Other
Supported 3D Format Side-by-side Format (using the Utility application software)
LED Indicator Yes
Firmware Update Supported (requires connecting to PC by USB Type-C)
Supported OS for Host Device (USB Type Connection)
Windows 10® (depends on supported status of USB Type-C on connected device), Android 8.0 or later
Global Navigation Satellite System GPS/GLONASS/Galileo/ QZSS/BDS
Firmware Update Supports (OTA)

General
Operating 41 °F to 95 °F (5 °C to 35 °C)
Humidity (Operating) 20% to 80%
Temperature (Storage) 14 °F to 140 °F (-10 °C to 60 °C)
Humidity (Storage, Unfrozen) 10% to 90%
USB Power Delivery
Headset
Rev 3.0
Input [5.0] V [0.9]A
Controller
Rev 2.0
Input [5.0]V [2]A
Output Yes
Headset Dimensions (W x D x H)
194 mm x 164 mm x 41 mm (without shade)
Controller Dimensions (W x D x H)
55 mm x 110 mm x 23 mm
Headset Weight Approx. 3.4 oz
Controller Weight Approx. 6.5 oz
Battery 3,400 mAh
Battery Type Lithium Polymer
Waterproof IPx2 (except for USB port)

What's in the Box
Dark Shade, Headset User Guide, Controller User Guide, Safety Instructions, USB Cable, SD Card Slot Pin

Language
OSD English
Language EN/JA/FR/ES/PT/DE/IT/NL/ZHT/UK/DA/FI/NO/SV/CS/PL/ HU/TR/RU/AR/KK

Developer Resources
Developer Portal https://tech.moverio.epson.com/en/
Videos/Webinars www.youtube.com/moverio

Eco Features
RoHS compliant
Recyclable product²
Epson America, Inc. is a SmartWay® Transport Partner³

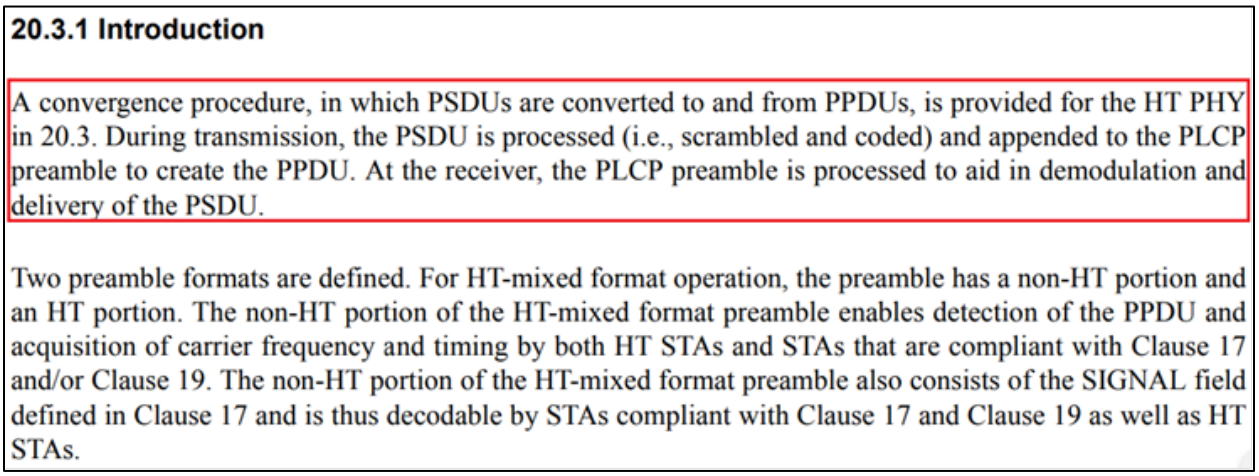
Ordering Information

Moverio BT-40S Smart Glasses	V11H969120
Moverio BT-40 3 Nose pad pack	V12HA51W01
1 OTG nose pad pack	V12HA50W01
Moverio BT-40 3 Shade Pack	V12HA49W01
Moverio BO-IC400 Intelligent Controller	V12HA24020

(Source : https://epson.com/medias/Moverio-BT-40s-Product-Specification-Sheet-CPD-60657-Final.pdf?context=bWFzdGVyfHJvb3R8NTE0Mjk5fGFwcGxpY2F0aW9uL3BkZnxoMzYvaDQ0Lzk2MzIyNzcxMDI2MjIucGRmfDI3Y2ZhYmIxNWFlZGYxYTlmOTRmMmFjNWQ0NmRmOGMzN2RkMGM4MTYyMGU1Mzc1MmU3OTFiM2U0N2MwNjc3NDc)

54. The accused products include L OFDM demodulators, each OFDM demodulator corresponding to a respective receiving antenna, the L OFDM demodulators including a synchronization circuit that processes the received frame in order to synchronize the received

frame in both time domain and frequency domain. For example, there is a demodulator block for performing demodulation on the received frames. Further, synchronizing the received frame in time and frequency domains occurs. In an OFDM transmitter section, a modulated signal is converted into time domain and is transmitted as multiple frames of data. The functional blocks present at the receiver end processes the received data, converts the data into frequency domain, and performs demodulation. Various signal bits present in the transmitted frames' preamble helps in demodulating the signal. A demodulator block is present at the receiver to perform demodulation. Different fields of data like training bits, cyclic prefixes and other signal bits present in the received frame helps in synchronizing the frame in both time and frequency domain. There is a synchronization circuit which processes the received frame and synchronizes them in both time and frequency domain.



20.3.1 Introduction

A convergence procedure, in which PSDUs are converted to and from PPDUs, is provided for the HT PHY in 20.3. During transmission, the PSDU is processed (i.e., scrambled and coded) and appended to the PLCP preamble to create the PPDU. At the receiver, the PLCP preamble is processed to aid in demodulation and delivery of the PSDU.

Two preamble formats are defined. For HT-mixed format operation, the preamble has a non-HT portion and an HT portion. The non-HT portion of the HT-mixed format preamble enables detection of the PPDU and acquisition of carrier frequency and timing by both HT STAs and STAs that are compliant with Clause 17 and/or Clause 19. The non-HT portion of the HT-mixed format preamble also consists of the SIGNAL field defined in Clause 17 and is thus decodable by STAs compliant with Clause 17 and Clause 19 as well as HT STAs.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

3.244 receive chain: The physical entity that implements any necessary signal processing to provide the received signal to the digital baseband. Such signal processing includes filtering, amplification, down-conversion, and sampling.

3.245 sounding: The use of preamble training fields to measure the channel for purposes other than demodulation of the Data portion of the physical layer convergence procedure (PLCP) protocol data unit (PPDU) containing the training fields.

NOTE—These uses include calculation of transmit steering, calculation of recommended MCS, and calculation of calibration parameters.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

The encoding process is composed of the steps described below. The following overview is intended to facilitate an understanding of the details of the convergence procedure:

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

a)	Detect the start of frame.
b)	Detect the transition from short sequences to channel estimation sequences, and establish fine timing (with one sample resolution).
c)	Estimate the coarse and fine frequency offsets.
d)	Derotate the frame according to estimated frequency offset.
e)	Estimate the complex channel response coefficients for each of the subcarriers and each of the transmit chains.
f)	For each of the data OFDM symbols, transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers in all spatial streams, derotate the subcarrier values according to estimated phase, group the results from all the receiver chains in each subcarrier to a vector, multiply the vector by a zero-forcing equalization matrix generated from the channel estimated during the channel estimation phase.
g)	For each data-carrying subcarrier in each spatial stream, find the closest constellation point and compute the Euclidean distance from it.
h)	Compute the average of the RMS of all errors in a frame. It is given by Equation (20-89).

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

55. The accused products include wherein each of the L OFDM demodulators comprises a pre-amplifier, a local oscillator, a mixer having a first input and a second input, the first input connected to an output of the pre-amplifier, the second input connected to an output of the local oscillator, an analog-to-digital converter (ADC) connected to an output of the mixer. The demodulating section at the receiver end includes a pre-amplifier, a local oscillator, a mixer, and an ADC. The received frames undergo filtering, amplification (pre-amplifier), down-conversion and sampling (ADC). There are respective functional blocks for performing these functions. After transmitting the data, the data is received by a receiving antenna for further processing. To prevent the demodulator from demodulating the noise associated with the received signal, an RF front end circuit is implemented to increase the SNR of the demodulated signal. The RF front end circuit generally consists of amplifiers, local oscillator, filters and mixers. The output from the mixer is generally fed to an analog-to-digital converter (ADC). This RF front end circuit generally lies at the start of the demodulation process.

3.244 receive chain: The physical entity that implements any necessary signal processing to provide the received signal to the digital baseband. Such signal processing includes filtering, amplification, down-conversion, and sampling.

3.245 sounding: The use of preamble training fields to measure the channel for purposes other than demodulation of the Data portion of the physical layer convergence procedure (PLCP) protocol data unit (PPDU) containing the training fields.

NOTE—These uses include calculation of transmit steering, calculation of recommended MCS, and calculation of calibration parameters.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

The technique to combat a low SNR_{demod_in} is by adding a front end block, which processes (conditions) the received signal/AWGN/interference before admitting it to the demodulator. This processing can be done in several ways:

(Source: VLSI for Wireless Communication)

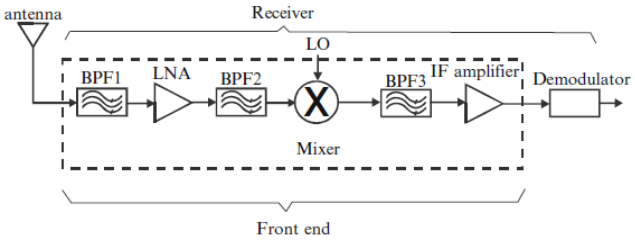


Fig. 2.2 RF receiver using a heterodyne architecture

(Source: VLSI for Wireless Communication)

2.4 Rest of Receiver Front End: Nonidealities and Design Parameters

Now that we have talked about the design of filters in the receiver front, we turn our attention to the design of the rest of the components. Normally these components consist of circuits such as LNA, mixer, IF amplifier, and analog/digital (A/D) converter. Unlike filters, their relevant design parameters are different. Hence our first task is to discuss these design parameters.

(Source: VLSI for Wireless Communication)

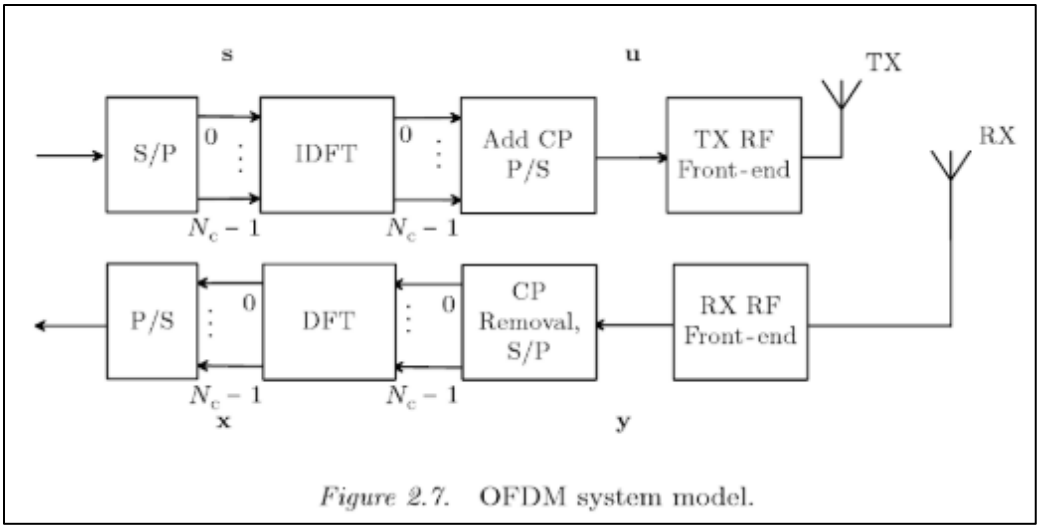


Figure 2.7. OFDM system model.

(Source: RF Imperfections in High-rate Wireless Systems: Impact and Digital Compression, Schenk, Tim)

The RF front end is generally defined as everything between the antenna and the digital baseband system. For a receiver, this "between" area includes all the filters, low-noise amplifiers (LNAs), and down-conversion mixer(s) needed to process the modulated signals received at the antenna into signals suitable for input into the baseband analog-to-digital converter (ADC). For this reason, the RF front end is often called the analog-to-digital or RF-to-baseband portion of a receiver.

(Source: https://www.eetimes.com/document.asp?doc_id=1276331)

56. The accused products include the synchronization circuit having one input connected to an output of the ADC. The PPDU frames that are transmitted are demodulated at the receiver end. The demodulation process includes estimating time and frequency offsets and synchronizing accordingly.

a) Detect the start of frame.

b) Detect the transition from short sequences to channel estimation sequences, and establish fine timing (with one sample resolution).

c) Estimate the coarse and fine frequency offsets.

d) Derotate the frame according to estimated frequency offset.

e) Estimate the complex channel response coefficients for each of the subcarriers and each of the transmit chains.

f) For each of the data OFDM symbols, transform the symbol into subcarrier received values, estimate the phase from the pilot subcarriers in all spatial streams, derotate the subcarrier values according to estimated phase, group the results from all the receiver chains in each subcarrier to a vector, multiply the vector by a zero-forcing equalization matrix generated from the channel estimated during the channel estimation phase.

g) For each data-carrying subcarrier in each spatial stream, find the closest constellation point and compute the Euclidean distance from it.

h) Compute the average of the RMS of all errors in a frame. It is given by Equation (20-89).

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

The RF front end is generally defined as everything between the antenna and the digital baseband system. For a receiver, this "between" area includes all the filters, low-noise amplifiers (LNAs), and down-conversion mixer(s) needed to process the modulated signals received at the antenna into signals suitable for input into the baseband analog-to-digital converter (ADC). For this reason, the RF front end is often called the analog-to-digital or RF-to-baseband portion of a receiver.

(Source: https://www.eetimes.com/document.asp?doc_id=1276331)

57. The accused products include a cyclic-prefix remover connected to an output of the synchronization circuit, a serial-to-parallel converter connected to an output of the cyclic prefix remover, and a discrete Fournier transform (DFT) stage connected to an output of the serial-to-parallel converter, an output of the DFT stage connected to another input to the synchronization circuit. Cyclic prefixes are added in the preamble for each transmitted frame. In a general OFDM system, a cyclic prefix remover circuit would be present at the receiver end. The output from the cyclic prefix remover circuit would be fed to a serial-to-parallel converter

for performing a DFT operation on its output. The evidence also shows that the output of the DFT stage is connected to the phase correction block that is part of the synchronization circuit.

The encoding process is composed of the steps described below. The following overview is intended to facilitate an understanding of the details of the convergence procedure:

a) Determine the number of transmit chains, N_{TX}, from the N_TX field of the TXVECTOR. Produce the PLCP preamble training fields for each of the N_{TX} transmit chains based on the FORMAT, NUM_EXTEN_SS, CH_BANDWIDTH, and MCS parameters of the TXVECTOR. The format and relative placement of the PLCP preamble training fields vary depending on the frame format being used, as indicated by these parameters. Apply cyclic shifts. Determine spatial mapping to be used for HT-STF and HT-LTFs in HT-mixed format frame and HT-GF-STF and HT-LTFs in HT-greenfield format frame from the EXPANSION_MAT parameter of the TXVECTOR. Refer to 20.3.9 for details.

b) Construct the PLCP preamble SIGNAL fields from the appropriate fields of the TXVECTOR by adding tail bits, applying convolutional coding, formatting into one or more OFDM symbols, applying cyclic shifts, applying spatial processing, calculating an inverse Fourier transform for each OFDM symbol and transmit chain, and prepending a cyclic prefix or GI to each OFDM symbol in each transmit chain. The number and placement of the PLCP preamble SIGNAL fields depend on the frame format being used. Refer to 20.3.9.3.5, 20.3.9.4.3, and 20.3.9.5.3.

c) Concatenate the PLCP preamble training and SIGNAL fields for each transmit chain one field after another, in the appropriate order, as described in 20.3.2 and 20.3.7.

(Source: http://luci.subsignal.org/~jow/802.11n-2009.pdf)

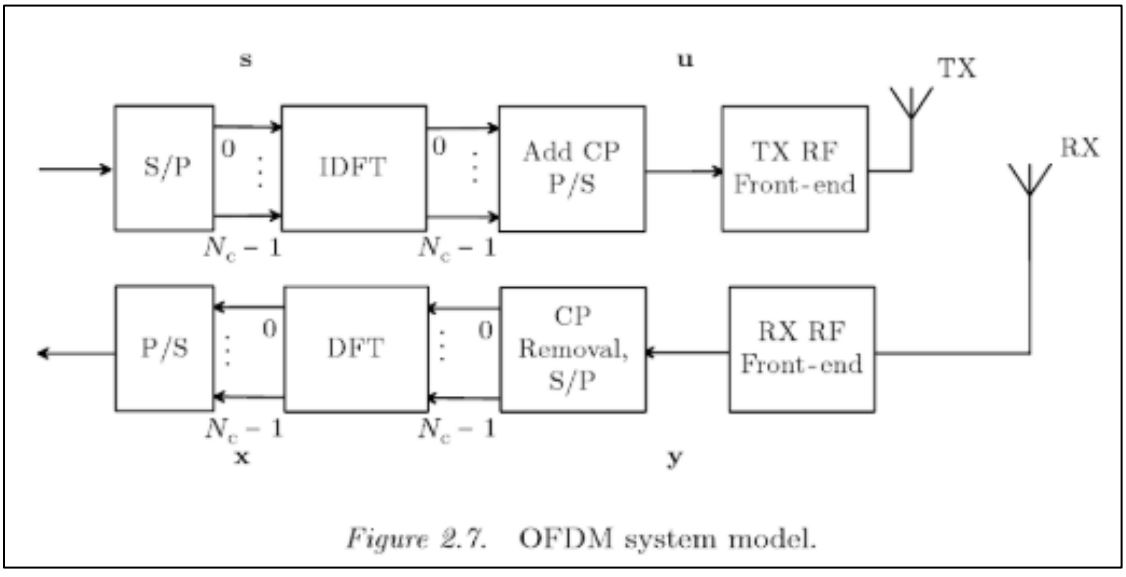


Figure 2.7. OFDM system model.

(Source: RF Imperfections in High-rate Wireless Systems: Impact and Digital Compression, Schenk, Tim)

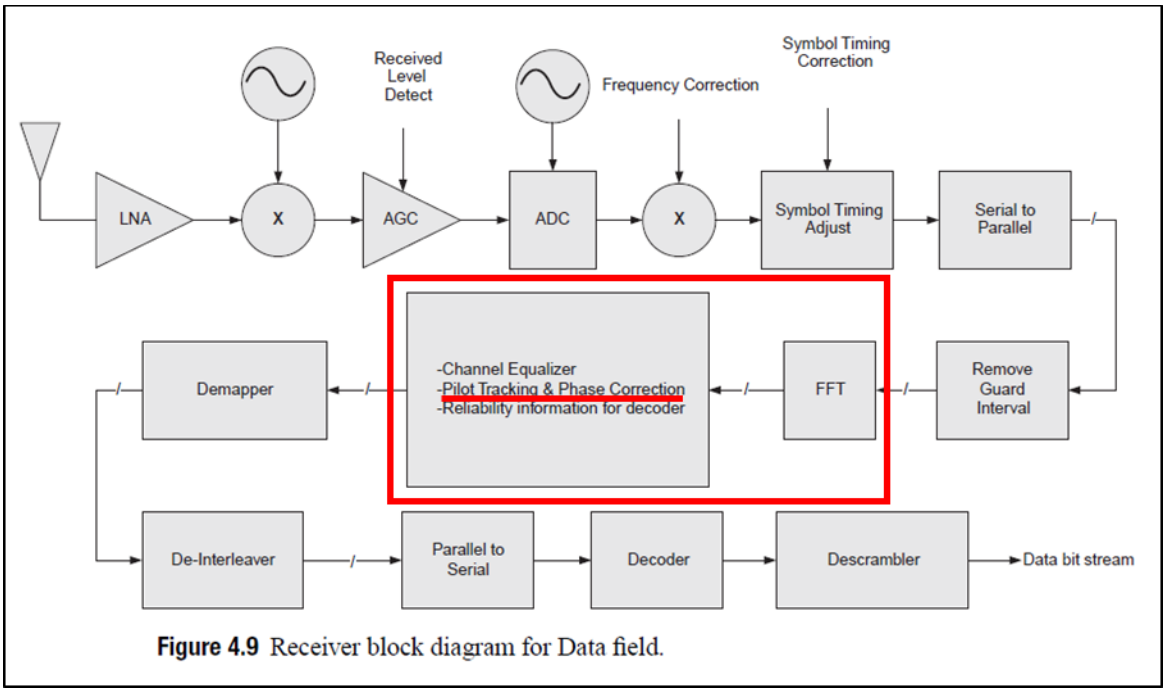


Figure 4.9 Receiver block diagram for Data field.

(Source: Next Generation Wireless LANs: 802.11n and 802.11ac, Perahia, Eldad and Stacey, Robert)

58. Epson has had actual knowledge of the '458 Patent at least as of the date when it was notified of the filing of this action. By the time of trial, Epson will have known and intended (since receiving such notice) that its continued actions would infringe and actively induce and contribute to the infringement of one or more claims of the '458 Patent.

59. Epson has also indirectly and willfully infringed, and continues to indirectly and willfully infringe, the '458 Patent, as explained further below in the "Additional Allegations Regarding Infringement" section.

60. American Patents has been damaged as a result of the infringing conduct by Epson alleged above. Thus, Epson is liable to American Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

61. American Patents has neither made nor sold unmarked articles that practice the '458 Patent, and is entitled to collect pre-filing damages for the full period allowed by law for infringement of the '458 Patent.

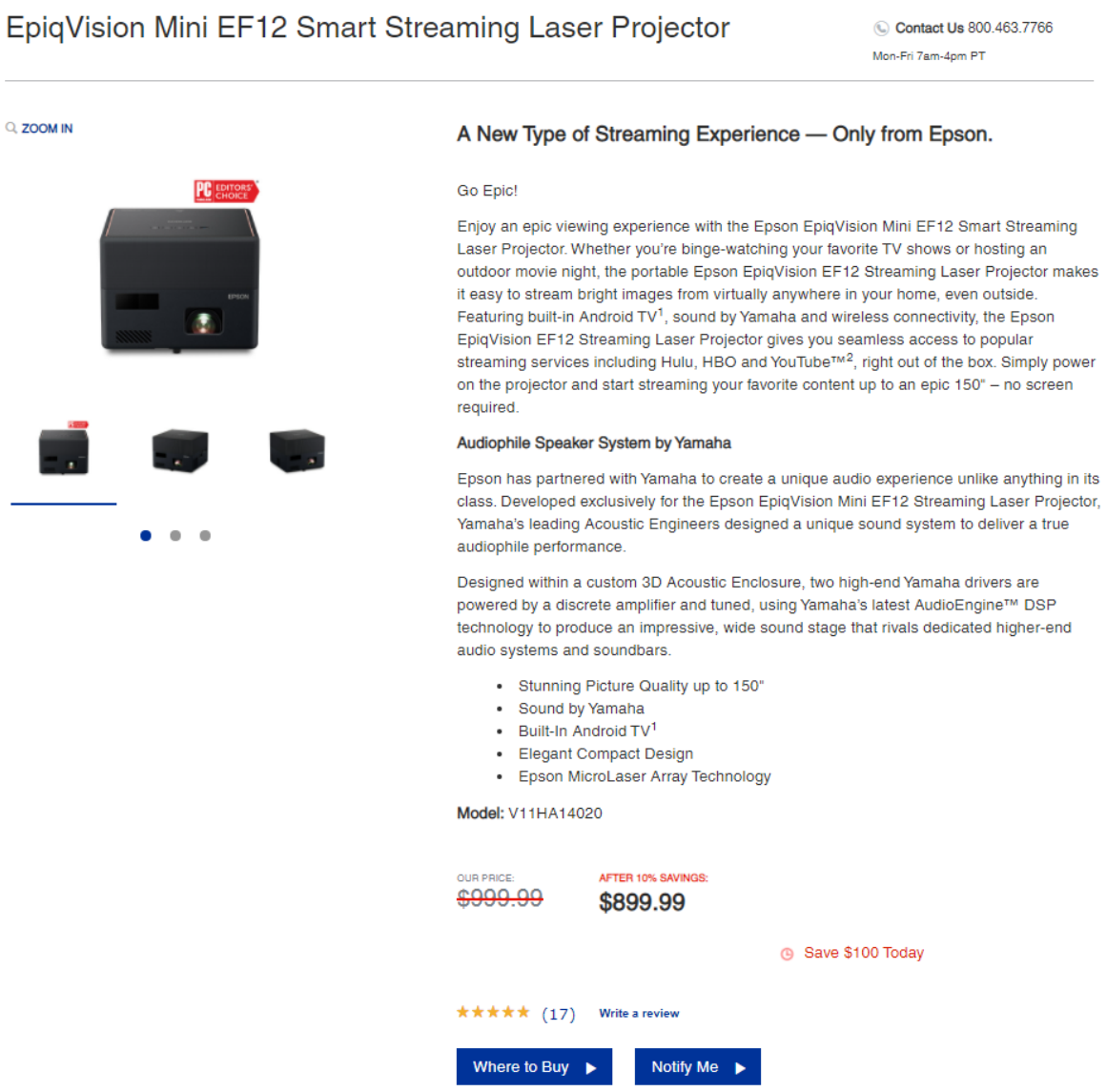
COUNT IV

INFRINGEMENT OF U.S. PATENT NO. 6,847,803

62. On January 25, 2005, United States Patent No. 6,847,803 ("the '803 Patent") was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Method for Reducing Interference in a Receiver."

63. American Patents is the owner of the '803 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the '803 Patent against infringers, and to collect damages for all relevant times.

64. Epson made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Epson EpiqVision Mini EF12 Smart Streaming Laser Projector and Epson Moverio BT-350 Smart Glasses families of products, that include 802.11ac beamforming capabilities ("accused products"):



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Designed within a custom 3D Acoustic Enclosure, two high-end Yamaha drivers are powered by a discrete amplifier and tuned, using Yamaha's latest AudioEngine™ DSP technology to produce an impressive, wide sound stage that rivals dedicated higher-end audio systems and soundbars.

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- Sound by Yamaha
- Built-In Android TV[1]
- Elegant Compact Design
- Epson MicroLaser Array Technology

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(Source : https://epson.com/For-Work/Wearables/Smart-Glasses/Moverio-BT-350-Smart-Glasses/p/V11H837020)

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Designed for multi-user applications, Moverio BT-350 smart glasses feature an adjustable design, made to fit multiple sizes. Ideal for indoor and outdoor use, these highly transparent glasses redefine augmented reality (AR) with a groundbreaking Si-OLED display. Motion-tracking sensors and a high-resolution camera make it ideal for 360-degree apps. The binocular display enables stereoscopic content too. With wireless and Bluetooth Smart (BLE) connectivity, the BT-350 supports multiple accessories.

(Source : https://www.zones.com/site/product/index.html?id=105247274)

Wi-Fi CERTIFIED™ Certificate

This certificate lists the features that have successfully completed Wi-Fi Alliance interoperability testing. Learn more: www.wi-fi.org/certification/programs

Certification ID: WFA101028

Product Info

Date of Certification	July 8, 2020
Company	Seiko Epson Corporation
Product Name	Multimedia Projector[EF-12 series]
Product Model Variant	2020-07-08 (WFA101028 - 11359044)
Model Number	EF-12
Category	Computers & Accessories
Sub-category	Projector

Summary of Certifications

CLASSIFICATION	CERTIFICATION
Connectivity	2.4 GHz Spectrum Capabilities 5 GHz Spectrum Capabilities Wi-Fi CERTIFIED™ a Wi-Fi CERTIFIED™ ac Wi-Fi CERTIFIED™ b Wi-Fi CERTIFIED™ g Wi-Fi CERTIFIED™ n

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

Wi-Fi CERTIFIED™ Certificate

Certification ID: WFA101028

Role: Station Page 2 of 2

Wi-Fi Components

Wi-Fi Component Operating System

Android, version:9

Wi-Fi Component Firmware

9.87.51

RF Architecture

Bands Supported	Transmit (Tx)	Receive (Rx)
2.4 GHz	2	2
5 GHz	2	2

Certifications

2.4 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width

5 GHz Spectrum Capabilities

20 MHz Channel Width
40 MHz Channel Width
80 MHz Channel Width

Protected Management Frames

WMM®

WPA2™-Personal 2018-04

Wi-Fi CERTIFIED™ ac (continued)

Short Guard Interval
LDPC Tx
SU beamformee

Wi-Fi CERTIFIED™ b

Wi-Fi CERTIFIED™ g

Wi-Fi CERTIFIED™ n

STBC
A-MPDU Tx
HT Duplicate Mode
OBSS on Extension Channel
Short Guard Interval

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=84383)

Wi-Fi CERTIFIED™ Certificate

This certificate lists the features that have successfully completed Wi-Fi Alliance interoperability testing. Learn more: www.wi-fi.org/certification/programs

Certification ID: WFA71453

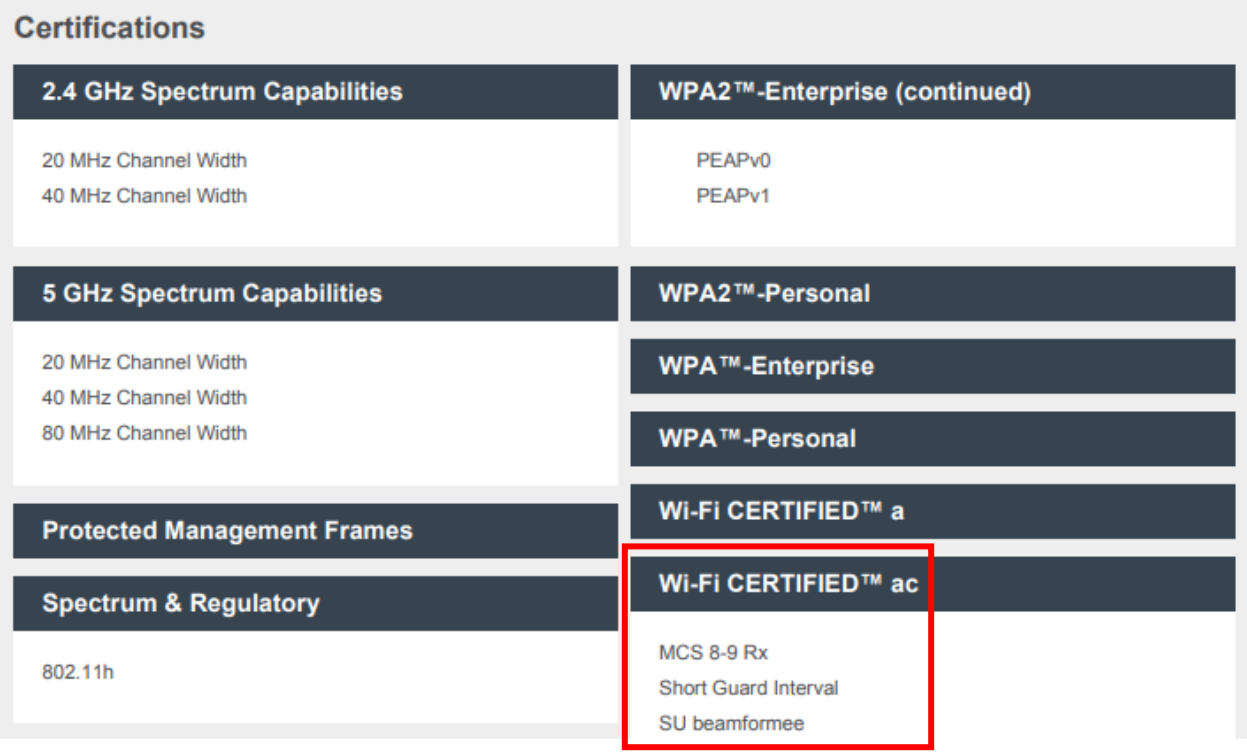
Product Info

Date of Certification	April 19, 2017
Company	Seiko Epson Corporation
Product Name	MOVERIO BT-350
Product Model Variant	2017-04-19 (WFA71453 - 5653110)
Model Number	BT-350
Category	Computers & Accessories
Sub-category	Monitor

Summary of Certifications

CLASSIFICATION	CERTIFICATION
Access	Wi-Fi Protected Setup™
Applications & Services	Miracast® Wi-Fi Direct®
Connectivity	2.4 GHz Spectrum Capabilities 5 GHz Spectrum Capabilities Wi-Fi CERTIFIED™ a Wi-Fi CERTIFIED™ ac Wi-Fi CERTIFIED™ b Wi-Fi CERTIFIED™ g Wi-Fi CERTIFIED™ n

(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=60867)



(Source : https://api.cert.wi-fi.org/api/certificate/download/public?variantId=60867)

Beamforming and MU-MIMO

Beamforming is key for the support of multiuser MIMO, or MU-MIMO, which is becoming more popular as 802.11ax routers roll out. As the name implies, MU-MIMO involves multiple users that can each communicate to multiple antennas on the router. MU-MIMO uses beamforming to make sure communication from the router is efficiently targeted to each connected client.

(Source: https://www.networkworld.com/article/3445039/beamforming-explained-how-it-makes-wireless-communication-faster.html)

65. By doing so, Epson has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 1 of the '803 Patent.

66. Epson has infringed the '803 Patent by using the accused products and thereby practicing a method for reducing interference in a receiver for receiving information in receiving time slots, in which receiver signals are received with at least a first antenna (ANT1) and a second antenna (ANT2). For example, the accused products are and have been used by Defendant to implement the IEEE 802.11-2016 Standard, whose requirements were in effect five years before the Complaint. Devices that can communicate using 802.11 protocol are known as Stations (STAs). Multiple Input Multiple Output (MIMO) and Beamforming techniques are and have been used by a STA with multiple antennas for steering the signals to each STA ("receiver") for reception. In such MIMO transmissions, the space-time streams in the transmitted signal would be intended for reception by each STA in its corresponding time slots. These time slots at which the STA receives the space-time streams with actual data information can be construed as receiving time slots. Since, there are multiple antennas, when they transmit simultaneously, the signal appears as interference at each of the receive antennas. Further, a STA will also be able to identify the space-time streams intended for other STAs that act as interference. STA uses the channel state information that is obtained by estimating a channel to reduce the interference caused by other space time streams. The beamforming calibration procedures ("method for reducing interference") involves channel estimation and matrix calculations which help in reducing the interference in a receiver. Indeed, the IEEE 802.11-2016 Standard shows MIMO systems with two STAs (i.e., STA A and STA B) using multiple antennas ("a first antenna (ANT1) and a second antenna (ANT2)") for receiving transmitted signals.

21.3.11.1 General

SU-MIMO and DL-MU-MIMO beamforming are techniques used by a STA with multiple antennas (the beamformer) to steer signals using knowledge of the channel to improve throughput. With SU-MIMO beamforming all space-time streams in the transmitted signal are intended for reception at a single STA. With DL-MU-MIMO beamforming, disjoint subsets of the space-time streams are intended for reception at different STAs.

(Source : IEEE 802.11-2016 Standard, p. 2578)

19.3.12 Beamforming

19.3.12.1 General

Beamforming is a technique in which the beamformer utilizes the knowledge of the MIMO channel to generate a steering matrix Q_k that improves reception in the beamformee.

(Source : IEEE 802.11-2016 Standard, p. 2392)

A STA is also able to identify the space-time streams intended for other STAs that act as interference. VHT-LTF symbols in the VHT MU PPDU are used to measure the channel for the space-time streams intended for the STA and can also be used to measure the channel for the interfering space-time streams. To successfully demodulate the space-time streams intended for the STA, the STA may use the channel state information for all space-time streams to reduce the effect of interfering space-time streams.

(Source : IEEE 802.11-2016 Standard, p. 2580)

(2) (**STA**tion) A client device in an 802.11 (Wi-Fi) wireless network such as a computer, laptop or smartphone. The term STA is sometimes used for the access point (AP) as well, in which case a STA is any device communicating via the 802.11 protocol. See wireless LAN and access point.

(Source : https://www.pcmag.com/encyclopedia/term/sta)

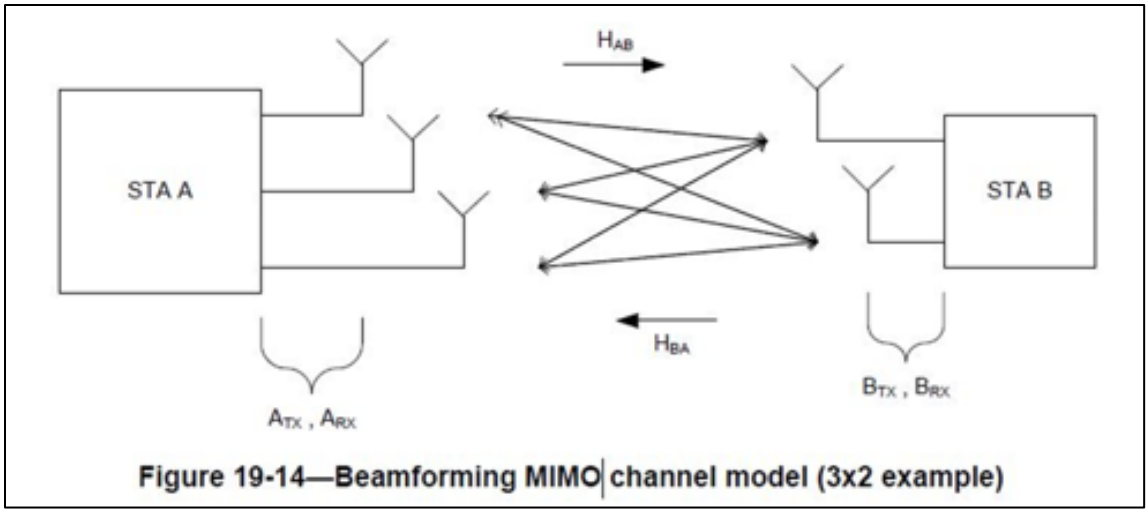


Figure 19-14—Beamforming MIMO channel model (3x2 example)

(Source : IEEE 802.11-2016 Standard, p. 2393)

67. The methods practiced by Epson's use of the accused products include methods where signals are received with said first antenna (ANT1) and second antenna (ANT2) at moments of time other than in said receiving time slot, when no information is being received. For example, the accused products are and have been used by Defendant to implement the IEEE 802.11-2016 Standard, whose requirements were in effect five years before the Complaint. A STA in that Standard transmits data in PHY Protocol Data Units (PPDUs). PPDUs can be transmitted in High Throughput (HT) mode and Very High Throughput (VHT) mode. A Null Data Packet (NDP) can be transmitted in both HT and VHT Modes. Training Fields (TFs) inside the NDP carry no data related information and can be used as sounding PPDUs in beamforming calibration procedures. Sounding PPDUs would help in channel estimation at the STA. Certain TFs include the interference information which is used as reference during calibration procedures. The NDPs ("signals received") in HT-PPDU and VHT PPDU format includes several TFs which are and have been used as a reference for the receiver to perform calibration/tuning. Thus, there is no actual data information that is received during the

beamforming calibration procedures ("at moments of time other than in said receiving time slots").

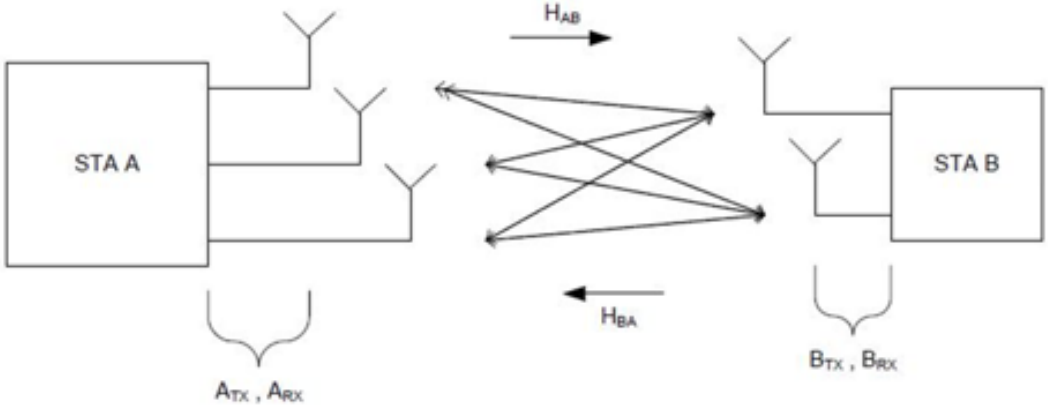


Figure 19-14—Beamforming MIMO channel model (3x2 example)

(Source : IEEE 802.11-2016 Standard, p. 2393)

Table 19-5—Elements of the HT PPDU

Element	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
HT-SIG	HT SIGNAL field
HT-STF	HT Short Training field
HT-GF-STF	HT-Greenfield Short Training field
HT-LTF1	First HT Long Training field (Data)
HT-LTFs	Additional HT Long Training fields (Data and Extension)
Data	The Data field includes the PSDU

(Source : IEEE 802.11-2016 Standard, p. 2347)

Table 21-4—Fields of the VHT PPDU

Field	Description
L-STF	Non-HT Short Training field
L-LTF	Non-HT Long Training field
L-SIG	Non-HT SIGNAL field
VHT-SIG-A	VHT Signal A field
VHT-STF	VHT Short Training field
VHT-LTF	VHT Long Training field
VHT-SIG-B	VHT Signal B field
Data	The Data field carrying the PSDU(s)

The VHT-SIG-A, VHT-STF, VHT-LTF, and VHT-SIG-B fields exist only in VHT PPDUs. In a VHT NDP the Data field is not present. The number of symbols in the VHT-LTF field, N_{VHTLTF}, can be either 1, 2, 4, 6, or 8 and is determined by the total number of space-time streams across all users being transmitted in the VHT PPDU (see Table 21-13).

(Source : IEEE 802.11-2016 Standard, p. 2514)

In both HT-mixed format and HT-greenfield format frames, there are two types of HT-LTFs: Data HT-LTFs (HT-DLTFs) and Extension HT-LTFs (HT-ELTFs). HT-DLTFs are always included in HT PPDUs to provide the necessary reference for the receiver to form a channel estimate that allows it to demodulate the data

(Source : IEEE 802.11-2016 Standard, p. 2347)

null data packet (NDP): A physical layer (PHY) protocol data unit (PPDU) that carries no Data field.

off-channel: A channel used by a tunneled direct link setup (TDLS) station (STA) that does not overlap the channel(s) used by the access point (AP) with which the TDLS STA is associated.

(Source : IEEE 802.11-2016 Standard, p. 157)

sounding physical layer (PHY) protocol data unit (PPDU): A PPDU that is intended by the transmitting station (STA) to enable the receiving STA to estimate the channel between the transmitting STA and the receiving STA. The Not Sounding field in the High Throughput SIGNAL field (HT-SIG) is equal to 0 in sounding PPDUs.

(Source : IEEE 802.11-2016 Standard, p. 163)

21.3.12 VHT preamble format for sounding PPDUs

NDP is the only VHT sounding format.

The format of a VHT NDP PPDU is shown in Figure 21-28.

Figure 21-28—VHT NDP format

NOTE—The number of VHT-LTF symbols in the NDP is determined by the SU NSTS field in VHT-SIG-A.

The VHT NDP PPDU has the following properties:

— Uses the VHT PPDU format but without the Data field.
— Is a VHT SU PPDU as indicated by the VHT-SIG-A field.
— Has the data bits of the VHT-SIG-B field set to a fixed bit pattern (see 21.3.8.3.6).

(Source : IEEE 802.11-2016 Standard, p. 2580)

10.34 Null data packet (NDP) sounding

10.34.1 HT NDP sounding protocol

Sounding may be accomplished using either staggered sounding PPDU or HT NDP, as described in 19.3.13. The MAC rules associated with sounding using HT NDP are described in 10.34.1 to 10.34.4.

(Source : IEEE 802.11-2016 Standard, p. 1485)

68. The methods practiced by Epson's use of the accused products include methods in which a reference signal representing interference in said other time slot is formed and used for the tuning of the receiver in said receiving time slots. For example, the accused products are and have been used by Defendant to implement the IEEE 802.11-2016 Standard, whose requirements were in effect five years before the Complaint. In that Standard, beamforming techniques are and have been used to improve the reception at a receiver STA. These techniques use the channel state information and generate steering matrices for the transmission of data. There are two types of beamforming methods described in the standard, Implicit feedback beamforming and Explicit feedback beamforming. A steering matrix, Q_k, is calculated in both beamforming methods.

Explicit feedback beamforming enables a beamformee i.e., receiving STA to calculate beamforming feedback matrix based on the received sounding packets/PPDUs. NDPs can be used as sounding PPDUs and hence, no data/information is received during the beamforming procedures. The Standard shows a scenario wherein STA A (transmit STA) transmits a sounding packet (which can be NDP PPDU) that is used by STA B (receiving STA) to calculate a beamforming feedback matrix V_k ("reference signal"). The feedback matrix is later sent to STA A for determining a steering matrix which is used to tune and re-calibrate the receiver STA in order to demodulate the transmitted signal. Implicit feedback beamforming enables STA to estimate a MIMO channel and calculate channel matrices, based on a received sounding PPDU. NDPs can be used as sounding PPDUs and hence, no data/information is received during the beamforming procedures. The Standard shows a scenario wherein STA A and STA B (receiving STA) follow beamforming calibration procedures using sounding PPDUs. STA A and STA B will exchange sounding PPDUs (which can be NDP PPDUs), using which each of the STAs will estimate respective channel matrices. Quantized estimates of the channel matrices ("reference signal") are sent from STA B to STA A. Later, STA A uses its local estimates and the received quantized estimates from STA B to calculate set of correction matrices. These correction matrices that are formed using the received quantized estimates, are applied at transmit side of a STA to correct/tune the amplitude and phase differences in transmit and receive chains. All the above discussed steps are performed as a part of beamforming calibration procedures using sounding PPDUs. The Standard also shows equations for the received signal with beamforming. The channel estimates and beamforming steering matrix are and have been used to tune and re-calibrate the receiver in order to demodulate the transmitted signal.

19.3.12 Beamforming

19.3.12.1 General

Beamforming is a technique in which the beamformer utilizes the knowledge of the MIMO channel to generate a steering matrix Q_k that improves reception in the beamformee.

The equivalent complex baseband MIMO channel model is one in which, when a vector $\mathbf{x}_k = [x_1, x_2, \ldots x_{N_{TX}}]^T$ is transmitted in subcarrier k, the received vector $\mathbf{y}_k = [y_1, y_2, \ldots y_{N_{RX}}]^T$ is modeled as shown in Equation (19-62).

$$\mathbf{y}_k = H_k \mathbf{x}_k + \mathbf{n} \quad (19\text{-}62)$$

where

H_k is channel matrix of dimensions $N_{RX} \times N_{TX}$

$\mathbf{n}$ is white (spatially and temporally) Gaussian noise as illustrated in Figure 19-14

(Source : IEEE 802.11-2016 Standard, p. 2392-2393)

When beamforming is used, the beamformer replaces $\mathbf{x}_k$, which in this case has $N_{STS} \leq N_{TX}$ elements, with $Q_k \mathbf{x}_k$, where Q_k has N_{TX} rows and N_{STS} columns, so that the received vector is as shown in Equation (19-63).

$$\mathbf{y}_k = H_k Q_k \mathbf{x}_k + \mathbf{n} \quad (19\text{-}63)$$

The beamforming steering matrix that is computed (or updated) from a new channel measurement replaces the existing Q_k for the next beamformed data transmission. There are several methods of beamforming, differing in the way the beamformer acquires the knowledge of the channel matrices H_k and on whether the beamformer generates Q_k or the beamformee provides feedback information for the beamformer to generate Q_k.

(Source : IEEE 802.11-2016 Standard, p. 2393)

19.3.12.3 Explicit feedback beamforming

19.3.12.3.1 General

In explicit beamforming, in order for STA A to transmit a beamformed packet to STA B, STA B measures the channel matrices and sends STA A either the effective channel, $H_{eff,k}$, or the beamforming feedback matrix, V_k, for STA A to determine a steering matrix, $Q_{steer,k} = Q_k V_k$, with V_k found from $H_k Q_k$, where Q_k is the orthonormal spatial mapping matrix that was used to transmit the sounding packet that elicited the V_k feedback. The effective channel, $H_{eff,k} = H_k Q_k$, is the product of the spatial mapping matrix used on transmit with the channel matrix. When new steering matrix $Q_{steer,k}$ is found, $Q_{steer,k}$ may replace Q_k for the next beamformed data transmission.

NOTE—$Q_{steer,k}$ is a mathematical term to update a new steering matrix for Q_k in the next beamformed data transmission.

(Source : IEEE 802.11-2016 Standard, p. 1477)

10.32.3 Explicit feedback beamforming

The procedures in this subclause apply only to HT and non-HT PPDUs for which the HT Control field, if present, is the HT variant HT Control field.

In this subclause, the terms *HT beamformer* and *HT beamformee* refer to STAs that are involved in explicit feedback beamforming.

An HT beamformer uses the feedback response that it receives from the HT beamformee to calculate a beamforming feedback matrix for transmit beamforming. This feedback response may have one of three formats:

— *CSI*: The HT beamformee sends the MIMO channel coefficients to the HT beamformer.
— *Noncompressed beamforming*: The HT beamformee sends calculated beamforming feedback matrices to the HT beamformer.
— *Compressed beamforming*: The HT beamformee sends compressed beamforming feedback matrices to the HT beamformer.

(Source : IEEE 802.11-2016 Standard, p. 1477)

10.34 Null data packet (NDP) sounding

10.34.1 HT NDP sounding protocol

Sounding may be accomplished using either staggered sounding PPDU or HT NDP, as described in 19.3.13. The MAC rules associated with sounding using HT NDP are described in 10.34.1 to 10.34.4.

(Source : IEEE 802.11-2016 Standard, p. 1477)

10.34.5 VHT sounding protocol

10.34.5.1 General

Transmit beamforming and DL-MU-MIMO require knowledge of the channel state to compute a steering matrix that is applied to the transmitted signal to optimize reception at one or more receivers. The STA transmitting using the steering matrix is called the *VHT beamformer*, and a STA for which reception is optimized is called a *VHT beamformee*. An explicit feedback mechanism is used where the VHT beamformee directly measures the channel from the training symbols transmitted by the VHT beamformer and sends back a transformed estimate of the channel state to the VHT beamformer. The VHT beamformer then uses this estimate, perhaps combining estimates from multiple VHT beamformees, to derive the steering matrix.

(Source : IEEE 802.11-2016 Standard, p. 1477)

21.3.12 VHT preamble format for sounding PPDUs

NDP is the only VHT sounding format.

The format of a VHT NDP PPDU is shown in Figure 21-28.

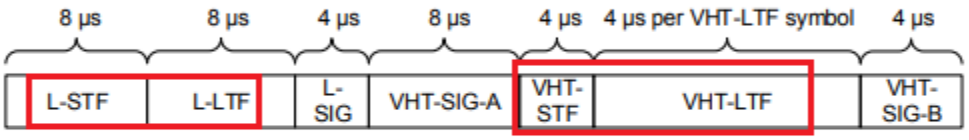


Figure 21-28—VHT NDP format

NOTE—The number of VHT-LTF symbols in the NDP is determined by the SU NSTS field in VHT-SIG-A.

The VHT NDP PPDU has the following properties:

- Uses the VHT PPDU format but without the Data field.
- Is a VHT SU PPDU as indicated by the VHT-SIG-A field.
- Has the data bits of the VHT-SIG-B field set to a fixed bit pattern (see 21.3.8.3.6).

(Source : IEEE 802.11-2016 Standard, p. 2580)

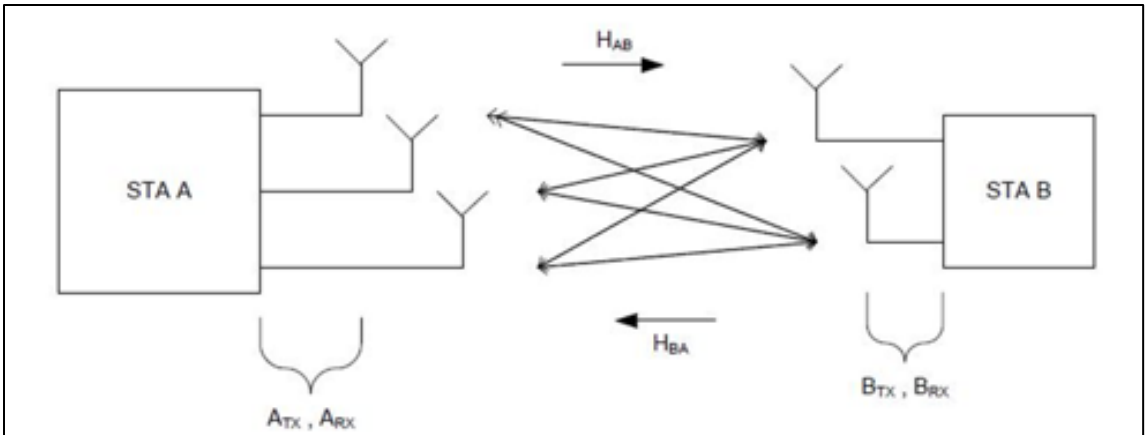


Figure 19-14—Beamforming MIMO channel model (3x2 example)

(Source : IEEE 802.11-2016 Standard, p. 2393)

Focusing on STA A, the procedure for estimating $K_{A,k}$ is as follows:

a) STA A sends STA B a sounding PPDU, the reception of which allows STA B to estimate the channel matrices $\tilde{H}_{AB,k}$.

b) STA B sends STA A a sounding PPDU, the reception of which allows STA A to estimate the channel matrices $\tilde{H}_{BA,k}$.

c) STA B sends the quantized estimates of $\tilde{H}_{AB,k}$ to STA A.

d) STA A uses its local estimates of $\tilde{H}_{BA,k}$ and the quantized estimates of $\tilde{H}_{AB,k}$ received from STA B to compute the correction matrices $K_{A,k}$.

(Source : IEEE 802.11-2016 Standard, p. 2395)

Figure 10-48 and Figure 10-49 illustrate the calibration PPDU exchange using NDPs.

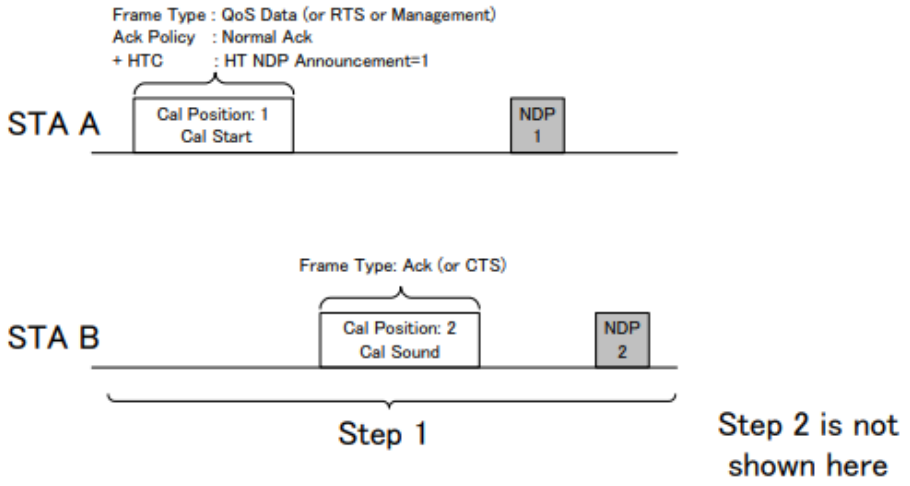


Figure 10-48—Calibration procedure with NDP

(Source : IEEE 802.11-2016 Standard, p. 1475)

21.3.12 VHT preamble format for sounding PPDUs

NDP is the only VHT sounding format.

The format of a VHT NDP PPDU is shown in Figure 21-28.

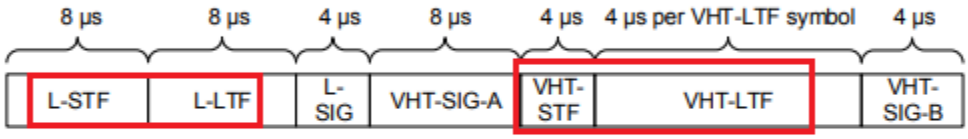


Figure 21-28—VHT NDP format

NOTE—The number of VHT-LTF symbols in the NDP is determined by the SU NSTS field in VHT-SIG-A.

The VHT NDP PPDU has the following properties:

— Uses the VHT PPDU format but without the Data field.
— Is a VHT SU PPDU as indicated by the VHT-SIG-A field.
— Has the data bits of the VHT-SIG-B field set to a fixed bit pattern (see 21.3.8.3.6).

(Source : IEEE 802.11-2016 Standard, p. 2580)

While the over-the-air channel between the antenna(s) at one STA and the antenna(s) at a second STA is reciprocal, the observed baseband-to-baseband channel used for communication might not be, as it includes the transmit and receive chains of the STAs. Differences in the amplitude and phase characteristics of the transmit and receive chains associated with individual antennas degrade the reciprocity of the over-the-air channel and cause degradation of performance of implicit beamforming techniques. The over-the-air calibration procedure described in 10.32.2.4 may be used to restore reciprocity. The procedure provides the means for calculating a set of correction matrices that can be applied at the transmit side of a STA to correct the amplitude and phase differences between the transmit and receive chains in the STA. If this correction is done at least at the STA that serves as the beamformer, there is sufficient reciprocity for implicit feedback in the baseband-to-baseband response of the forward link and reverse channel.

(Source : IEEE 802.11-2016 Standard, p. 2394)

19.3.13.3 Sounding PPDU for calibration

In the case of a bidirectional calibration exchange, two STAs exchange sounding PPDUs, the exchange of which enables the receiving STA to compute an estimate of the MIMO channel matrix H_k for each subcarrier k. In general, in an exchange of calibration messages, the number of spatial streams is less than the number of transmit antennas. In such cases, HT-ELTFs are used. In the case of sounding PPDUs for calibration, the antenna mapping matrix shall be as shown in Equation (19-86).

(Source : IEEE 802.11-2016 Standard, p. 2401)

Two preamble formats are defined. For HT-mixed format operation, the preamble has a non-HT portion and an HT portion. The non-HT portion of the HT-mixed format preamble enables detection of the PPDU and acquisition of carrier frequency and timing by both HT STAs and STAs that are compliant with Clause 17 and/or Clause 18. The non-HT portion of the HT-mixed format preamble also consists of the SIGNAL field defined in Clause 17 and is thus decodable by STAs compliant with Clause 17 and Clause 18 as well as HT STAs.

The HT portion of the HT-mixed format preamble enables estimation of the MIMO channel to support demodulation of the HT data by HT STAs. The HT portion of the HT-mixed format preamble also includes the HT-SIG field, which supports HT operation. The SERVICE field is prepended to the PSDU.

(Source : IEEE 802.11-2016 Standard, p. 2346)

19.3.12 Beamforming

19.3.12.1 General

Beamforming is a technique in which the beamformer utilizes the knowledge of the MIMO channel to generate a steering matrix Q_k that improves reception in the beamformee.

The equivalent complex baseband MIMO channel model is one in which, when a vector $\mathbf{x}_k = [x_1, x_2, \ldots x_{N_{TX}}]^T$ is transmitted in subcarrier k, the received vector $\mathbf{y}_k = [y_1, y_2, \ldots y_{N_{RX}}]^T$ is modeled as shown in Equation (19-62).

$$\mathbf{y}_k = H_k \mathbf{x}_k + \mathbf{n} \quad (19\text{-}62)$$

where

H_k is channel matrix of dimensions $N_{RX} \times N_{TX}$

$\mathbf{n}$ is white (spatially and temporally) Gaussian noise as illustrated in Figure 19-14

(Source : IEEE 802.11-2016 Standard, p. 2392-2393)

When beamforming is used, the beamformer replaces $\mathbf{x}_k$, which in this case has $N_{STS} \leq N_{TX}$ elements, with $Q_k \mathbf{x}_k$, where Q_k has N_{TX} rows and N_{STS} columns, so that the received vector is as shown in Equation (19-63).

$$\mathbf{y}_k = H_k Q_k \mathbf{x}_k + \mathbf{n} \quad (19\text{-}63)$$

The beamforming steering matrix that is computed (or updated) from a new channel measurement replaces the existing Q_k for the next beamformed data transmission. There are several methods of beamforming, differing in the way the beamformer acquires the knowledge of the channel matrices H_k and on whether the beamformer generates Q_k or the beamformee provides feedback information for the beamformer to generate Q_k.

(Source : IEEE 802.11-2016 Standard, p. 2393)

69. American Patents only asserts method claims from the ‘803 Patent.

70. American Patents has been damaged as a result of the infringing conduct by Epson alleged above. Thus, Epson is liable to American Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

ADDITIONAL ALLEGATIONS REGARDING INFRINGEMENT

71. In addition to any specific products mentioned above, the accused products also include at least the following products: Epson Artisan 1430 Inkjet Printer, Epson Artisan 700 All-in-One Printer, Epson Artisan 710 All-in-One Printer, Epson Artisan 725 All-in-One Printer, Epson Artisan 725 All-in-One Printer - Arctic Edition, Epson Artisan 730 All-in-One Printer, Epson Artisan 800 All-in-One Printer, Epson Artisan 810 All-in-One Printer, Epson Artisan 835 All-in-One Printer, Epson Artisan 837 All-in-One Printer, Epson BrightLink 1480Fi 1080p 3LCD Interactive Laser Display, Epson BrightLink 1485Fi 1080p 3LCD Interactive Laser Display, Epson BrightLink 425Wi, Epson BrightLink 430i, Epson BrightLink 435Wi, Epson BrightLink 436Wi Interactive WXGA 3LCD Projector, Epson BrightLink 475Wi Interactive WXGA 3LCD Projector with Mount, Epson BrightLink 480i Interactive XGA 3LCD Projector with Mount, Epson BrightLink 485Wi Interactive WXGA 3LCD Projector with Mount, Epson BrightLink 536Wi, Epson BrightLink 575Wi Interactive WXGA 3LCD Projector, Epson BrightLink 585Wi Interactive WXGA 3LCD Projector, Epson BrightLink 595Wi Interactive WXGA 3LCD Projector, Epson BrightLink 685Wi WXGA 3LCD Ultra Short-throw Interactive Display, Epson BrightLink 695Wi WXGA 3LCD Ultra Short-throw Interactive Display, Epson BrightLink 696Ui Full HD 3LCD Ultra Short-throw Interactive Display, Epson BrightLink 697Ui, Epson BrightLink 710Ui, Epson BrightLink 725Wi WXGA 3LCD Interactive Laser Display, Epson BrightLink 735Fi 1080p 3LCD Interactive Laser Display, Epson BrightLink Pro 1410Wi Meeting Room Productivity Tool with Wall Mount, Epson BrightLink Pro 1420Wi Collaborative Whiteboarding Solution, Epson BrightLink Pro 1430Wi Collaborative Whiteboarding Solution with Touch, Epson BrightLink Pro 1450Ui Full HD Interactive Display, Epson BrightLink Pro 1460Ui Full HD Interactive Display, Epson BrightLink Pro 1470Ui

WUXGA 3LCD Interactive Laser Display, Epson DNUB-E1, Epson DS-575W II Wireless Color Duplex Document Scanner, Epson DS-575W Wireless Color Document Scanner, Epson DS-80W Wireless Portable Document Scanner, Epson EcoTank ET-15000 All-in-One Cartridge-Free Supertank Printer, Epson EcoTank ET-2720 All-in-One Supertank Printer - Black, Epson EcoTank ET-2720 All-in-One Supertank Printer - White, Epson EcoTank ET-2760 All-in-One Cartridge-Free Supertank Printer, Epson EcoTank ET-3710 All-in-One Cartridge-Free Supertank Printer, Epson EcoTank ET-3760 All-in-One Cartridge-Free Supertank Printer, Epson EcoTank ET-4700 All-in-One Supertank Printer, Epson EcoTank ET-4760 All-in-One Cartridge-Free Supertank Printer - Black, Epson EcoTank ET-4760 All-in-One Cartridge-Free Supertank Printer - White, Epson EcoTank ET-M1170 Wireless Monochrome Supertank Printer, Epson EcoTank ET-M2170 Wireless Monochrome All-in-One Supertank Printer, Epson EcoTank ET-M3170 Wireless Monochrome All-in-One Supertank Printer, Epson EcoTank Photo ET-8500 Wireless Color All-in-One Supertank Printer, Epson EcoTank Photo ET-8550 All-in-One Wide-format Supertank Printer, Epson EcoTank Pro ET-16600 Wide-format All-in-One Supertank Printer, Epson EcoTank Pro ET-16650 Wide-format All-in-One Supertank Printer, Epson EcoTank Pro ET-5150 Wireless All-in-One Supertank Printer, Epson EcoTank Pro ET-5170 Wireless All-in-One Supertank Printer, Epson EcoTank Pro ET-5800 All-in-One Cartridge-Free Supertank Printer, Epson EcoTank Pro ET-5850 All-in-One Cartridge-Free Supertank Printer, Epson EcoTank Pro ET-5880 All-in-One Cartridge-Free Supertank Printer with PCL Support, Epson EF-100 Mini-Laser Streaming Projector with Android TV - Black, Epson EF-100 Mini-Laser Streaming Projector with Android TV - White, Epson EpiqVision Mini EF12 Smart Streaming Laser Projector, Epson EpiqVision Ultra LS500 Ultra Short Throw Laser Projector (Black), Epson EpiqVision Ultra LS500 Ultra Short Throw Laser Projector (White), Epson ET-2750U for

ReadyPrint, Epson ET-3750U for ReadyPrint, Epson ET-5850U for ReadyPrint, Epson EX3220 SVGA 3LCD Projector, Epson EX3240 SVGA 3LCD Projector, Epson EX3260 SVGA 3LCD Projector, Epson EX5230 Pro XGA 3LCD Projector, Epson EX5240 XGA 3LCD Projector, Epson EX5250 Pro Wireless XGA 3LCD Projector, Epson EX5260 Wireless XGA 3LCD Projector, Epson EX5280 3LCD XGA Projector, Epson EX6220 WXGA 3LCD Projector, Epson EX7220 Wireless WXGA 3LCD Projector, Epson EX7230 Pro HD WXGA 3LCD Projector, Epson EX7235 Pro Wireless HD WXGA 3LCD Projector, Epson EX7240 Pro Wireless WXGA 3LCD Projector, Epson EX9200 Pro Wireless WUXGA 3LCD Projector, Epson Expression ET-2500 EcoTank All-in-One Printer, Epson Expression ET-2550 EcoTank All-in-One Printer, Epson Expression ET-2600 EcoTank All-in-One Printer, Epson Expression ET-2650 EcoTank All-in-One Printer, Epson Expression ET-2700 EcoTank All-in-One Supertank Printer, Epson Expression ET-2750 EcoTank All-in-One Supertank Printer, Epson Expression ET-3600 EcoTank All-in-One Supertank Printer, Epson Expression ET-3700 EcoTank All-in-One Supertank Printer, Epson Expression Home XP-200 Small-in-One All-in-One Printer, Epson Expression Home XP-300 Small-in-One All-in-One Printer, Epson Expression Home XP-310 Small-in-One All-in-One Printer, Epson Expression Home XP-320 Small-in-One All-in-One Printer, Epson Expression Home XP-330 Small-in-One All-in-One Printer, Epson Expression Home XP-340 Small-in-One All-in-One Printer, Epson Expression Home XP-400 Small-in-One All-in-One Printer, Epson Expression Home XP-410 Small-in-One All-in-One Printer, Epson Expression Home XP-4100 Small-in-One Printer, Epson Expression Home XP-4105 Small-in-One Printer, Epson Expression Home XP-420 Small-in-One All-in-One Printer, Epson Expression Home XP-424 Small-in-One All-in-One Printer, Epson Expression Home XP-430 Small-in-One Printer, Epson Expression Home XP-434 Small-in-One All-in-One Printer, Epson

Expression Home XP-440 Small-in-One Printer, Epson Expression Home XP-446 Small-in-One Printer, Epson Expression Home XP-5100 Small-in-One Printer, Epson Expression Photo HD XP-15000 Wide-format Printer, Epson Expression Photo XP-850 Small-in-One All-in-One Printer, Epson Expression Photo XP-8500 Small-in-One All-in-One Printer, Epson Expression Photo XP-860 Small-in-One All-in-One Printer, Epson Expression Photo XP-8600 Small-in-One Printer, Epson Expression Photo XP-950 Small-in-One All-in-One Printer, Epson Expression Photo XP-960 Small-in-One All-in-One Printer, Epson Expression Photo XP-970 Small-in-One Printer, Epson Expression Premium ET-7700 EcoTank All-in-One Supertank Printer, Epson Expression Premium ET-7750 EcoTank Wide-format All-in-One Supertank Printer, Epson Expression Premium XP-520 Small-in-One All-in-One Printer, Epson Expression Premium XP-530 Small-in-One All-in-One Printer, Epson Expression Premium XP-600 Small-in-One Printer, Epson Expression Premium XP-6000 Small-in-One Printer, Epson Expression Premium XP-610 Small-in-One All-in-One Printer, Epson Expression Premium XP-6100 Small-in-One Printer, Epson Expression Premium XP-620 Small-in-One All-in-One Printer, Epson Expression Premium XP-630 Small-in-One All-in-One Printer, Epson Expression Premium XP-640 Small-in-One All-in-One Printer, Epson Expression Premium XP-7100 Small-in-One Printer, Epson Expression Premium XP-800 Small-in-One Printer, Epson Expression Premium XP-810 Small-in-One All-in-One Printer, Epson Expression Premium XP-820 Small-in-One All-in-One Printer, Epson Expression Premium XP-830 Small-in-One All-in-One Printer, Epson FastFoto FF-680W Wireless High-speed Photo Scanning System, Epson Home Cinema 1080 3LCD 1080p Projector, Epson Home Cinema 1450 1080p 3LCD Projector, Epson Home Cinema 3000 2D/3D Full HD 1080p 3LCD Projector, Epson Home Cinema 3100 Full HD 1080p 3LCD Projector, Epson Home Cinema 3200 4K PRO-UHD 3-Chip Projector with HDR, Epson Home Cinema

3500 2D/3D Full HD 1080p 3LCD Projector, Epson Home Cinema 3600e Wireless 2D/3D Full HD 1080p 3LCD Projector, Epson Home Cinema 3700 Full HD 1080p 3LCD Projector, Epson Home Cinema 3800 4K PRO-UHD 3-Chip Projector with HDR, Epson Home Cinema 3900 Full HD 1080p 3LCD Projector, Epson Home Cinema 4000 3LCD Projector with 4K Enhancement and HDR, Epson Home Cinema 4010 4K PRO-UHD Projector with Advanced 3-Chip Design and HDR, Epson Home Cinema 5040UB 3LCD Projector with 4K Enhancement and HDR, Epson Home Cinema 5040UBe WirelessHD 3LCD Projector with 4Ke and HDR, Epson Home Cinema 5050UB 4K PRO-UHD Projector with Advanced 3-Chip Design and HDR10, Epson Home Cinema 5050UBe Wireless 4K PRO-UHD Projector with Advanced 3-Chip Design and HDR10, Epson Home Cinema 660 3LCD Projector, Epson Home Cinema 760 3LCD Projector, Epson Home Cinema 880 3LCD 1080p Projector, Epson Home Cinema LS100 Full HD 3LCD Ultra Short-throw Laser Projector, Epson Intelligent Controller BO-IC400, Epson LightScene EV-100 Accent Lighting 3LCD Laser Projector, Epson LightScene EV-105 Accent Lighting 3LCD Laser Projector, Epson LightScene EV-110 Accent Lighting 3LCD Laser Projector, Epson LightScene EV-115 Accent Lighting 3LCD Laser Projector, Epson LW-PX800 Printer, Epson LW-Z5000PX Printer, Epson LW-Z5000PX With Rewinder, Epson LW-Z5010PX Printer, Epson LW-Z5010PX Printer Kit, Epson LW-Z5010PX Pro Plus Kit, Epson LW-Z5010PX With Rewinder, Epson Mobilink P20 2" Mobile Receipt Printer, Epson Mobilink P60II 2" Mobile Receipt or Label Printer, Epson Mobilink P80 3" Mobile Receipt Printer, Epson Mobilink P80 Plus 3" Wireless Receipt Printer with Auto Cutter, Epson Moverio BT-200 Smart Glasses (Developer Version Only), Epson Moverio BT-300 (FPV-Drone Edition), Epson Moverio BT-300 Smart Glasses (AR/Developer Edition), Epson Moverio BT-350 Smart Glasses, Epson Moverio BT-350 Smart Glasses ANSI Z87.1 Edition, Epson Moverio BT-40S Smart

Glasses with Intelligent Touch Controller, Epson Moverio Pro BT-2200 Smart Headset, Epson OmniLink® TM-m50 POS Thermal Receipt Printer, Epson OmniLink TM-H6000IV-DT Intelligent Printer, Epson OmniLink TM-H6000V Multifunction POS Printer, Epson OmniLink TM-m30II-h POS Receipt Printer, Epson OmniLink TM-m30II-NT POS Receipt Printer, Epson OmniLink TM-m30II-SL POS Thermal Receipt Printer with Built-in Tablet Mount, Epson OmniLink TM-T20II-i Intelligent Printer with COM, Epson OmniLink TM-T70II-DT Intelligent Printer, Epson OmniLink TM-T88V-DT Intelligent Printer, Epson OmniLink TM-T88VI Single-station Thermal Receipt Printer, Epson OmniLink TM-T88VI-i Intelligent Thermal Receipt Printer, Epson OT-WL06 (M359A), Epson PictureMate PM-400 Personal Photo Lab, Epson PowerLite 107 XGA 3LCD Projector, Epson PowerLite 108 XGA 3LCD Projector, Epson PowerLite 109W WXGA 3LCD Projector, Epson PowerLite 118 3LCD XGA Classroom Projector with Dual HDMI, Epson PowerLite 119W 3LCD WXGA Classroom Projector with Dual HDMI, Epson PowerLite 1222 Wireless XGA 3LCD Projector, Epson PowerLite 1224 Wireless XGA 3LCD Projector, Epson PowerLite 1262W Wireless WXGA 3LCD Projector, Epson PowerLite 1263W Wireless HD WXGA 3LCD Projector, Epson PowerLite 1264 Wireless HD WXGA 3LCD Projector, Epson PowerLite 1266 Wireless WXGA 3LCD Projector, Epson PowerLite 1284 Wireless WUXGA 3LCD Projector, Epson PowerLite 1286 Wireless WUXGA 3LCD Projector, Epson PowerLite 1288 Full HD 1080p Meeting Room Projector with Built-in Wireless and Miracast, Epson PowerLite 1751 XGA 3LCD Projector, Epson PowerLite 1760W Multimedia Projector, Epson PowerLite 1761W WXGA 3LCD Projector, Epson PowerLite 1770W, Epson PowerLite 1771W WXGA 3LCD Projector, Epson PowerLite 1775W Multimedia Projector, Epson PowerLite 1776W WXGA 3LCD Projector, Epson PowerLite 1780W Wireless WXGA 3LCD Projector, Epson PowerLite 1781W Wireless WXGA 3LCD

Projector, Epson PowerLite 1785W Wireless WXGA 3LCD Projector, Epson PowerLite 1795F Wireless Full HD 1080p 3LCD Projector, Epson PowerLite 1835 XGA 3LCD Projector, Epson PowerLite 1945W WXGA 3LCD Projector, Epson PowerLite 1955 XGA 3LCD Projector, Epson PowerLite 1965 XGA 3LCD Projector, Epson PowerLite 1985WU WUXGA Wireless 3LCD Projector, Epson PowerLite 2040 XGA 3LCD Projector, Epson PowerLite 2042 XGA 3LCD Projector, Epson PowerLite 2065 Wireless XGA 3LCD Projector, Epson PowerLite 2140W WXGA 3LCD Projector, Epson PowerLite 2142W WXGA 3LCD Projector, Epson PowerLite 2155W Wireless WXGA 3LCD Projector, Epson PowerLite 2165W Wireless WXGA 3LCD Projector, Epson PowerLite 2247U Wireless Full HD WUXGA 3LCD Projector, Epson PowerLite 2250U Full HD WUXGA 3LCD Projector, Epson PowerLite 2255U Wireless Full HD WUXGA 3LCD Projector, Epson PowerLite 2265U Wireless Full HD WUXGA 3LCD Projector, Epson PowerLite 420 XGA 3LCD Projector, Epson PowerLite 425W WXGA 3LCD Projector, Epson PowerLite 430 XGA 3LCD Projector, Epson PowerLite 435W WXGA 3LCD Projector, Epson PowerLite 4650 XGA 3LCD Projector, Epson PowerLite 470 XGA 3LCD Projector, Epson PowerLite 4750W WXGA 3LCD Projector, Epson PowerLite 475W WXGA 3LCD Projector, Epson PowerLite 4770W WXGA 3LCD Projector, Epson PowerLite 480 XGA 3LCD Projector, Epson PowerLite 4855WU WUXGA 3LCD Projector, Epson PowerLite 485W WXGA 3LCD Projector, Epson PowerLite 520 XGA 3LCD Projector, Epson PowerLite 525W WXGA 3LCD Projector, Epson PowerLite 530 XGA 3LCD Projector, Epson PowerLite 530 XGA 3LCD Projector for SMART, Epson PowerLite 535W WXGA 3LCD Projector, Epson PowerLite 5510 XGA 3LCD Projector, Epson PowerLite 5520W WXGA 3LCD Projector, Epson PowerLite 5530U WUXGA 3LCD Projector, Epson PowerLite 5535U WUXGA 3LCD Projector, Epson PowerLite 570 XGA 3LCD Projector, Epson PowerLite 575W WXGA 3LCD

Projector, Epson PowerLite 580 XGA 3LCD Projector, Epson PowerLite 580 XGA 3LCD Projector for SMART, Epson PowerLite 585W WXGA 3LCD Projector, Epson PowerLite 585W WXGA 3LCD Projector for SMART, Epson PowerLite 675W WXGA 3LCD Presentation Display, Epson PowerLite 680 XGA 3LCD Presentation Display, Epson PowerLite 680 XGA 3LCD Presentation Display for SMART Board Interactive Whiteboards, Epson PowerLite 685W WXGA 3LCD Presentation Display, Epson PowerLite 685W WXGA 3LCD Ultra Short-Throw Presentation Display, Epson PowerLite 700U WUXGA 3LCD Ultra-short Throw Laser Display, Epson PowerLite 720 XGA 3LCD Ultra Short-throw Laser Display, Epson PowerLite 725W WXGA 3LCD Ultra Short-throw Laser Display, Epson PowerLite 750F Full HD 1080p Ultra Short-throw Laser Projector with Built-in Wireless, Epson PowerLite 755F Full HD 1080p Ultra Short-throw Laser Projector with Built-in Wireless, Epson PowerLite 800F Full HD 1080p Ultra Short-throw Laser Projector for Classrooms, Epson PowerLite 805F Full HD 1080p Ultra Short-throw Laser Projector for Digital Signage, Epson PowerLite 905 XGA 3LCD Projector, Epson PowerLite 915W WXGA 3LCD Projector, Epson PowerLite 935W WXGA 3LCD Projector, Epson PowerLite 95 XGA 3LCD Projector, Epson PowerLite 955W WXGA 3LCD Projector, Epson PowerLite 955WH WXGA 3LCD Projector, Epson PowerLite 965 XGA 3LCD Projector, Epson PowerLite 965H XGA 3LCD Projector, Epson PowerLite 96W WXGA 3LCD Projector, Epson PowerLite 970 XGA 3LCD Projector, Epson PowerLite 975W WXGA 3LCD Projector, Epson PowerLite 97H XGA 3LCD Projector, Epson PowerLite 98 XGA 3LCD Projector, Epson PowerLite 980W WXGA 3LCD Projector, Epson PowerLite 982W 3LCD WXGA Classroom Projector with Dual HDMI, Epson PowerLite 98H XGA 3LCD Projector, Epson PowerLite 990U WUXGA 3LCD Projector, Epson PowerLite 992F Full HD 1080p Classroom Projector with Built-in Wireless, Epson PowerLite 99W WXGA 3LCD Projector, Epson PowerLite 99WH

WXGA 3LCD Projector, Epson PowerLite D6150 XGA 3LCD Projector, Epson PowerLite D6155W WXGA 3LCD Projector, Epson PowerLite D6250 XGA 3LCD Projector, Epson PowerLite Home Cinema 1040 1080p 3LCD Projector, Epson PowerLite Home Cinema 2000 2D/3D 1080p 3LCD Projector, Epson PowerLite Home Cinema 2030 2D/3D 1080p 3LCD Projector, Epson PowerLite Home Cinema 2045 Wireless 3D 1080p 3LCD Projector, Epson PowerLite Home Cinema 600 3LCD Projector, Epson PowerLite Home Cinema 640 3LCD Projector, Epson PowerLite Home Cinema 725HD 720p 3LCD Projector, Epson PowerLite Home Cinema 730HD 720p 3LCD Projector, Epson PowerLite Home Cinema 740HD 720p 3LCD Projector, Epson PowerLite L200SW Wireless WXGA 3LCD Short-throw Laser Display, Epson PowerLite L200SX Wireless XGA 3LCD Short-throw Laser Display, Epson PowerLite L200W 3LCD WXGA Long-Throw Laser Projector with Built-in Wireless, Epson PowerLite L200X 3LCD XGA Long-Throw Laser Projector with Built-in Wireless, Epson PowerLite L250F 1080p 3LCD Standard-Throw Laser Projector with Built-in Wireless, Epson PowerLite L255F 1080p 3LCD Standard-Throw Laser Projector with Built-in Wireless, Epson PowerLite L400U WUXGA 3LCD Laser Projector, Epson PowerLite L500W WXGA 3LCD Laser Projector, Epson PowerLite L510U WUXGA 3LCD Laser Projector, Epson PowerLite L610 XGA 3LCD Laser Projector, Epson PowerLite L610U Wireless WUXGA 3LCD Laser Projector, Epson PowerLite L610W WXGA 3LCD Laser Projector, Epson PowerLite L615U Wireless WUXGA 3LCD Laser Projector, Epson PowerLite Pro G6050W WXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6070W WXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6150 XGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6170 XGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6270W WXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6450WU WUXGA 3LCD

Projector with Standard Lens, Epson PowerLite Pro G6470WU WUXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6550WU WUXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6570WU WUXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6750WU WUXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6770WU WUXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6800 XGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6870 XGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6900WU WUXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro G6970WU WUXGA 3LCD Projector with Standard Lens, Epson PowerLite Pro Z10000UNL WUXGA 3LCD Projector without Lens, Epson PowerLite Pro Z10005UNL WUXGA 3LCD Projector without Lens, Epson PowerLite Pro Z11000WNL WXGA 3LCD Projector without Lens, Epson PowerLite Pro Z11005NL XGA 3LCD Projector without Lens, Epson PowerLite Pro Z8150NL XGA 3LCD Projector, Epson PowerLite Pro Z8250NL XGA 3LCD Projector, Epson PowerLite Pro Z8255NL XGA 3LCD Projector, Epson PowerLite Pro Z8350WNL WXGA 3LCD Projector without Lens, Epson PowerLite Pro Z8450WUNL WUXGA 3LCD Projector, Epson PowerLite Pro Z8455WUNL WUXGA 3LCD Projector, Epson PowerLite Pro Z9750UNL WUXGA 3LCD Projector without Lens, Epson PowerLite Pro Z9800WNL WXGA 3LCD Projector without Lens, Epson PowerLite Pro Z9870NL XGA 3LCD Projector without Lens, Epson PowerLite Pro Z9870UNL WUXGA 3LCD Projector without Lens, Epson PowerLite Pro Z9900WNL WXGA 3LCD Projector without Lens, Epson PowerLite S17 SVGA 3LCD Projector, Epson PowerLite S27 SVGA 3LCD Projector, Epson PowerLite S39 SVGA 3LCD Projector, Epson PowerLite U50 WUXGA 3LCD Wireless Projector, Epson PowerLite W17 WXGA 3LCD Projector, Epson PowerLite W29 WXGA 3LCD Projector, Epson PowerLite W39 WXGA 3LCD Projector, Epson

PowerLite W49 3LCD WXGA Classroom Projector with HDMI, Epson PowerLite X17 XGA 3LCD Projector, Epson PowerLite X27 XGA 3LCD Projector, Epson PowerLite X39 XGA 3LCD Projector, Epson PowerLite X49 3LCD XGA Classroom Projector, Epson Pro Cinema 4040 3LCD Projector with 4K Enhancement and HDR, Epson Pro Cinema 4050 4K PRO-UHD Projector with Advanced 3-Chip Design and HDR, Epson Pro Cinema 6040UB 3LCD Projector with 4K Enhancement, HDR and ISF, Epson Pro Cinema 6050UB 4K PRO-UHD Projector with Advanced 3-Chip Design and HDR10, Epson Pro EX10000 3LCD Full HD 1080p Wireless Laser Projector with Miracast, Epson Pro EX7260 Wireless WXGA 3LCD Projector, Epson Pro EX7280 3LCD WXGA Projector, Epson Pro EX9210 Wireless 1080p+ WUXGA 3LCD Projector, Epson Pro EX9220 Wireless 1080p+ WUXGA 3LCD Projector, Epson Pro EX9240 3LCD Full HD 1080p Wireless Projector with Miracast, Epson Pro G7000W WXGA 3LCD Projector with Standard Lens, Epson Pro G7100 XGA 3LCD Projector with Standard Lens, Epson Pro G7200W WXGA 3LCD Projector with Standard Lens, Epson Pro G7400U WUXGA 3LCD Projector w/ 4K Enhancement & Standard Lens, Epson Pro G7500U WUXGA 3LCD Projector w/ 4K Enhancement & Standard Lens, Epson Pro G7805 XGA 3LCD Projector with Standard Lens, Epson Pro G7905U WUXGA 3LCD Projector w/ 4K Enhancement & Standard Lens, Epson Pro L1060U WUXGA 3LCD Laser Projector with 4K Enhancement, Epson Pro L1060UNL WUXGA 3LCD Laser Projector with 4K Enhancement, Epson Pro L1060W WXGA 3LCD Laser Projector, Epson Pro L1060WNL WXGA 3LCD Laser Projector, Epson Pro L1070U WUXGA 3LCD Laser Projector with 4K Enhancement, Epson Pro L1070UNL WUXGA 3LCD Laser Projector with 4K Enhancement, Epson Pro L1070W WXGA 3LCD Laser Projector, Epson Pro L1070WNL WXGA 3LCD Laser Projector, Epson Pro L1075U WUXGA 3LCD Laser Projector with 4K Enhancement, Epson Pro L1075UNL WUXGA 3LCD

Laser Projector with 4K Enhancement, Epson Pro L1100U Laser WUXGA 3LCD Projector w/ 4K Enhancement & Standard Lens, Epson Pro L1200U Laser WUXGA 3LCD Projector w/ 4K Enhancement & Standard Lens, Epson Pro L1300U Laser WUXGA 3LCD Projector w/ 4K Enhancement & Standard Lens, Epson Pro L1405U Laser WUXGA 3LCD Projector w/ 4K Enhancement & Standard Lens, Epson Pro L1490U WUXGA 3LCD Laser Projector with 4K Enhancement and Lens, Epson Pro L1490UNL WUXGA 3LCD Laser Projector with 4K Enhancement, Epson Pro L1495U WUXGA 3LCD Laser Projector with 4K Enhancement and Lens, Epson Pro L1495UNL WUXGA 3LCD Laser Projector with 4K Enhancement, Epson Pro L1500U Laser WUXGA 3LCD Projector with 4K Enhancement & Standard Lens, Epson Pro L1500UH WUXGA 3LCD Laser Projector with 4K Enhancement With Lens, Epson Pro L1500UHNL WUXGA 3LCD Laser Projector with 4K Enhancement Without Lens, Epson Pro L1505U Laser WUXGA 3LCD Projector with 4K Enhancement & Standard Lens, Epson Pro L1505UH WUXGA 3LCD Laser Projector with 4K Enhancement With Lens, Epson Pro L1505UHNL WUXGA 3LCD Laser Projector with 4K Enhancement Without Lens, Epson Pro L1715SNL SXGA+ 3LCD Laser Projector Without Lens, Epson Pro L1750UNL WUXGA 3LCD Laser Projector with 4K Enhancement Without Lens, Epson Pro L1755UNL WUXGA 3LCD Laser Projector with 4K Enhancement Without Lens, Epson Pro L25000U Laser WUXGA 3LCD Projector w/ 4K Enhancement, Epson Pro L30000UNL Laser WUXGA 3LCD Projector with 4K Enhancement, Epson Pro L30002UNL Laser WUXGA 3LCD Projector with 4K Enhancement, Epson RapidReceipt™ RR-600W Wireless Duplex Touchscreen Desktop Receipt & Color Document Scanner, Epson RapidReceipt™ RR-70W Wireless Mobile Receipt and Color Document Scanner, Epson Streaming Media Player STI6110-D101 , Epson Stylus NX230 Small-in-One All-in-One Printer, Epson Stylus NX330 Small-in-One All-in-One Printer,

Epson Stylus NX420 All-in-One Printer, Epson Stylus NX430 Small-in-One All-in-One Printer, Epson Stylus NX510 All-in-One Printer, Epson Stylus NX515 All-in-One Printer, Epson Stylus NX530 All-in-One Printer, Epson Stylus NX625 All-in-One Printer, Epson Stylus Photo R2000 Inkjet Printer, Epson Stylus Photo R3000 Inkjet Printer, Epson SureColor F170 Dye-Sublimation Printer, Epson SureColor F570 Dye-Sublimation Printer, Epson SureColor P400 Wide Format Inkjet Printer, Epson SureColor P600 Wide Format Inkjet Printer, Epson SureColor P700 13-Inch Photo Printer, Epson SureColor P800 Designer Edition Printer, Epson SureColor P800 Printer, Epson SureColor P800 Screen Print Edition Printer, Epson SureColor P900 17-Inch Photo Printer, Epson SureColor T2170 24-Inch Wireless Printer, Epson SureColor T3170 Wireless Printer, Epson SureColor T3170M 24" Wireless Printer with Integrated Scanner, Epson SureColor T3170x 24" Desktop Printer, Epson SureColor T3470 Printer, Epson SureColor T3475 Printer, Epson SureColor T5170 Wireless Printer, Epson SureColor T5170M 36" Wireless Printer with Integrated Scanner, Epson SureColor T5470 Printer, Epson SureColor T5470M 36" Printer and Scanner, Epson SureColor T5475 Printer, Epson TM-L90 Label Printer with Peeler, Epson TM-L90 Plus Label and Barcode Printer, Epson TM-L90 Plus Label Printer with Peeler, Epson TM-m10 Compact POS 2" Receipt Printer, Epson TM-m30 POS 3" Receipt Printer, Epson TM-m30II POS Receipt Printer, Epson TM-T20II POS Receipt Printer, Epson TM-T20III Thermal Receipt Printer, Epson TM-T70II POS Receipt Printer, Epson TM-T88V POS Receipt Printer, Epson TM-T88V-I Printer, Epson TM-U220 Receipt/Kitchen Printer, Epson VS230 SVGA 3LCD Projector, Epson VS240 SVGA 3LCD Projector, Epson VS250 SVGA 3LCD Projector, Epson VS260 3LCD XGA Projector, Epson VS330 XGA 3LCD Projector, Epson VS335W WXGA 3LCD Projector, Epson VS340 XGA 3LCD Projector, Epson VS345 WXGA 3LCD Projector, Epson VS350 XGA 3LCD Projector, Epson VS355 WXGA

3LCD Projector, Epson Wireless LAN Unit WN8111BEP, Epson WorkForce 323 All-in-One Printer, Epson WorkForce 325 All-in-One Printer, Epson WorkForce 40 Inkjet Printer, Epson WorkForce 435 All-in-One Printer, Epson WorkForce 520 All-in-One Printer, Epson WorkForce 545 All-in-One Printer, Epson WorkForce 60 Inkjet Printer, Epson WorkForce 600 All-in-One Printer, Epson WorkForce 610 All-in-One Printer, Epson WorkForce 615 All-in-One Printer, Epson WorkForce 630 All-in-One Printer, Epson WorkForce 633 All-in-One Printer, Epson WorkForce 635 All-in-One Printer, Epson WorkForce 645 All-in-One Printer, Epson WorkForce 840 All-in-One Printer, Epson WorkForce 845 All-in-One Printer, Epson WorkForce DS-40 Color Portable Scanner, Epson WorkForce DS-560 Wireless Color Document Scanner, Epson WorkForce EC-C110 Wireless Mobile Color Printer, Epson WorkForce EC-C7000 Color Multifunction Printer Up to 13 x 19 Inches, Epson WorkForce Enterprise WF-C17590 Color Multifunction Network Printer, Epson WorkForce Enterprise WF-C20590 A3 Color Multifunction Network Printer, Epson WorkForce Enterprise WF-C20600 Color Multifunction Printer, Epson WorkForce Enterprise WF-C20750 Color Multifunction Printer, Epson WorkForce Enterprise WF-C21000 Color Multifunction Printer, Epson WorkForce Enterprise WF-M20590 Monochrome Multifunction Network Printer, Epson WorkForce Enterprise WF-M20590F Monochrome Multifunction Printer, Epson WorkForce Enterprise WF-M21000 Monochrome Multifunction Printer, Epson WorkForce ES-300W Wireless Portable Duplex Document Scanner with ADF, Epson WorkForce ES-300WR Wireless Document Scanner — Accounting Edition, Epson WorkForce ES-500W II Wireless Duplex Desktop Document Scanner, Epson WorkForce ES-500W Wireless Duplex Document Scanner, Epson WorkForce ES-500WR Wireless Document Scanner — Accounting Edition, Epson WorkForce ES-580W Wireless Duplex Touchscreen Desktop Document Scanner, Epson WorkForce ES-60W Wireless

Portable Document Scanner, Epson WorkForce ES-65WR Wireless Portable Document Scanner — Accounting Edition, Epson WorkForce ET-16500 EcoTank Wide-format All-in-One Supertank Printer, Epson WorkForce ET-3750 EcoTank All-in-One Supertank Printer, Epson WorkForce ET-4500 EcoTank All-in-One Printer, Epson WorkForce ET-4550 EcoTank All-in-One Printer, Epson WorkForce ET-4750 EcoTank All-in-One Supertank Printer, Epson WorkForce Pro EC-4020 Color Multifunction Printer, Epson WorkForce Pro EC-4030 Color Multifunction Printer, Epson WorkForce Pro EC-4040 Color Multifunction Printer, Epson WorkForce Pro ET-8700 EcoTank All-in-One Supertank Printer, Epson WorkForce Pro WF-3720 All-in-One Printer, Epson WorkForce Pro WF-3730 All-in-One Printer, Epson WorkForce Pro WF-3733 All-in-One Printer, Epson WorkForce Pro WF-3820 Wireless All-in-One Printer, Epson WorkForce Pro WF-3823, Epson WorkForce Pro WF-4630 All-in-One Printer, Epson WorkForce Pro WF-4640 All-in-One Printer, Epson WorkForce Pro WF-4720 All-in-One Printer, Epson WorkForce Pro WF-4730 All-in-One Printer, Epson WorkForce Pro WF-4734 All-in-One Printer, Epson WorkForce Pro WF-4740 All-in-One Printer, Epson WorkForce Pro WF-4820 Wireless All-in-One Printer, Epson WorkForce Pro WF-4830 Wireless All-in-One Printer, Epson WorkForce Pro WF-4833, Epson WorkForce Pro WF-4834 Wireless All-in-One Printer, Epson WorkForce Pro WF-5110 Network Wireless Color Printer, Epson WorkForce Pro WF-5190 Network Color Printer with PCL/Adobe PS, Epson WorkForce Pro WF-5620, Epson WorkForce Pro WF-5690, Epson WorkForce Pro WF-6090 Printer with PCL/PostScript, Epson WorkForce Pro WF-6530 All-in-One Printer, Epson WorkForce Pro WF-6590 Network Multifunction Color Printer, Epson WorkForce Pro WF-7820 Wireless Wide-format All-in-One Printer, Epson WorkForce Pro WF-7840 Wireless Wide-format All-in-One Printer, Epson WorkForce Pro WF-8090 Network Color Printer w/ PCL/Postscript, Epson WorkForce Pro WF-

8590 Network Multifunction Color Printer, Epson WorkForce Pro WF-C5210 Network Color Printer with Replaceable Ink Pack, Epson WorkForce Pro WF-C5290 Network Color Printer with Replaceable Ink Pack System, Epson WorkForce Pro WF-C529R Workgroup Color Printer with Replaceable Ink Pack System, Epson WorkForce Pro WF-C5710 Network Multifunction Color Printer with Replaceable Ink Pack System, Epson WorkForce Pro WF-C5790 Color MFP Supertank Printer, Epson WorkForce Pro WF-C5790 Network Multifunction Color Printer with Replaceable Ink Pack System, Epson WorkForce Pro WF-C579R Workgroup Color MFP with Replaceable Ink Pack System, Epson WorkForce Pro WF-C8190 A3 Color Printer with PCL/PostScript, Epson WorkForce Pro WF-C8690 A3 Color MFP with PCL/PostScript, Epson WorkForce Pro WF-C869R Network Multifunction Color Printer, Epson WorkForce Pro WF-C878R Multifunction Color Printer, Epson WorkForce Pro WF-C879R Multifunction Color Printer, Epson WorkForce Pro WF-M5194 Workgroup Monochrome Printer, Epson WorkForce Pro WF-M5299 Workgroup Monochrome Printer, Epson WorkForce Pro WF-M5694, Epson WorkForce Pro WF-M5799 Monochrome MFP Supertank Printer, Epson WorkForce Pro WF-M5799 Workgroup Monochrome Multifunction Printer, Epson WorkForce Pro WF-R4640 EcoTank All-in-One, Epson WorkForce Pro WF-R5190 Replaceable Ink Pack System, Epson WorkForce Pro WF-R5690 Replaceable Ink Pack System, Epson WorkForce Pro WF-R8590 Network Multifunction Color Printer, Epson WorkForce Pro WP-4010 Network Color Printer, Epson WorkForce Pro WP-4020 Inkjet Printer, Epson WorkForce Pro WP-4023 Network Wireless Color Printer, Epson WorkForce Pro WP-4090 Network Color Printer with PCL, Epson WorkForce Pro WP-4520 Network Multifunction Color Printer, Epson WorkForce Pro WP-4530 All-in-One Printer, Epson WorkForce Pro WP-4533 Network Multifunction Wireless Color Printer, Epson WorkForce Pro WP-4540 All-in-One Printer, Epson WorkForce Pro WP-4590

Network Multifunction Color Printer with PCL, Epson WorkForce ST-2000 Supertank Color MFP, Epson WorkForce ST-3000 Color MFP Supertank Printer, Epson WorkForce ST-4000 Color MFP Supertank Printer, Epson WorkForce ST-C8000 Supertank Color MFP Printer, Epson WorkForce ST-M1000 Monochrome Supertank Printer, Epson WorkForce ST-M3000 Monochrome MFP Supertank Printer, Epson WorkForce WF-100 Mobile Printer, Epson WorkForce WF-110 Wireless Mobile Printer, Epson WorkForce WF-2520 All-in-One Printer, Epson WorkForce WF-2530 All-in-One Printer, Epson WorkForce WF-2540 All-in-One Printer, Epson WorkForce WF-2630 All-in-One Printer, Epson WorkForce WF-2650 All-in-One Printer, Epson WorkForce WF-2660 All-in-One Printer, Epson WorkForce WF-2750 All-in-One Printer, Epson WorkForce WF-2760 All-in-One Printer, Epson WorkForce WF-2830 All-in-One Printer, Epson WorkForce WF-2850 All-in-One Printer, Epson WorkForce WF-2860 All-in-One Printer, Epson WorkForce WF-3520 All-in-One Printer, Epson WorkForce WF-3530, Epson WorkForce WF-3540 All-in-One Printer, Epson WorkForce WF-3620 All-in-One Printer, Epson WorkForce WF-3640 All-in-One Printer, Epson WorkForce WF-7110 Inkjet Printer, Epson WorkForce WF-7210 Wide-format Printer, Epson WorkForce WF-7510 All-in-One Printer, Epson WorkForce WF-7520 All-in-One Printer, Epson WorkForce WF-7610 All-in-One Printer, Epson WorkForce WF-7620 All-in-One Printer, Epson WorkForce WF-7710 Wide-format All-in-One Printer, Epson WorkForce WF-7720 Wide-format All-in-One Printer, Epson WorkForce WF-M1030 Monochrome Inkjet Printer, and Epson WorkForce WF-M1560 Monochrome Multifunction Printer.

72. Epson has also indirectly infringed the ‘782 Patent, the ‘304 Patent, and the ‘458 Patent by inducing others to directly infringe the ‘782 Patent, the ‘304 Patent, and the ‘458 Patent. Epson has induced the end-users, Epson’s customers, to directly infringe (literally and/or

under the doctrine of equivalents) the '782 Patent, the '304 Patent, and the '458 Patent by using the accused products.

73. Epson took active steps, directly and/or through contractual relationships with others, with the specific intent to cause them to use the accused products in a manner that infringes one or more claims of the patents-in-suit, including, for example, Claim 30 of the '782 Patent, Claim 1 of the '304 Patent, and Claim 1 of the '458 Patent.

74. Such steps by Epson included, among other things, advising or directing customers and end-users to use the accused products in an infringing manner; advertising and promoting the use of the accused products in an infringing manner; and/or distributing instructions that guide users to use the accused products in an infringing manner.

75. Epson has performed these steps, which constitute induced infringement, with the knowledge of the '782 Patent, the '304 Patent, and the '458 Patent and with the knowledge that the induced acts constitute infringement.

76. Epson was and is aware that the normal and customary use of the accused products by Epson's customers would infringe the '782 Patent, the '304 Patent, and the '458 Patent. Epson's inducement is ongoing.

77. Epson has also induced its affiliates, or third-party manufacturers, shippers, distributors, retailers, or other persons acting on its or its affiliates' behalf, to directly infringe (literally and/or under the doctrine of equivalents) the '782 Patent, the '304 Patent, and the '458 Patent by importing, selling, offering to sell, and/or using the accused products.

78. Epson has at least a significant role in placing the accused products in the stream of commerce in Texas and elsewhere in the United States.

79. Epson directs or controls the making of accused products and their shipment to the United States, using established distribution channels, for sale in Texas and elsewhere within the United States.

80. Epson directs or controls the sale of the accused products into established United States distribution channels, including sales to nationwide retailers.

81. Epson's established United States distribution channels include one or more United States based affiliates (*e.g.*, at least Epson Accessories, Inc., Epson America, Inc., Epson Electronics America, Inc., Epson Portland Inc., Epson Research and Development, Inc., Sanyo Epson Imaging Devices Corporation, Epson Global, LLC, and U.S. Epson, Inc.).

82. Epson directs or controls the sale of the accused products nationwide on its own website as well as in nationwide retailers such as Best Buy, Amazon, Staples, Office Depot, Walmart, and Target, including for sale in Texas and elsewhere in the United States, and expects and intends that the accused products will be so sold.

83. Epson took active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, sell, or offer to sell the accused products in a manner that infringes one or more claims of the patents-in-suit, including, for example, Claim 30 of the '782 Patent, Claim 1 of the '304 Patent, and Claim 1 of the '458 Patent.

84. Such steps by Epson included, among other things, making or selling the accused products outside of the United States for importation into or sale in the United States, or knowing that such importation or sale would occur; and directing, facilitating, or influencing its affiliates, or third-party manufacturers, shippers, distributors, retailers, or other persons acting on its or their behalf, to import, sell, or offer to sell the accused products in an infringing manner.

85. Epson performed these steps, which constitute induced infringement, with the knowledge of the '782 Patent, the '304 Patent, and the '458 Patent and with the knowledge that the induced acts would constitute infringement.

86. Epson performed such steps in order to profit from the eventual sale of the accused products in the United States.

87. Epson's inducement is ongoing.

88. Epson has also indirectly infringed by contributing to the infringement of the '782 Patent, the '304 Patent, and the '458 Patent. Epson has contributed to the direct infringement of the '782 Patent, the '304 Patent, and the '458 Patent by the end-user of the accused products.

89. The accused products have special features that are specially designed to be used in an infringing way and that have no substantial uses other than ones that infringe the '782 Patent, the '304 Patent, and the '458 Patent, including, for example, Claim 30 of the '782 Patent, Claim 1 of the '304 Patent, and Claim 1 of the '458 Patent.

90. As described above, the special features include improved wireless communication capabilities used in a manner that infringes the '782 Patent, the '304 Patent, and the '458 Patent.

91. The special features constitute a material part of the invention of one or more of the claims of the '782 Patent, the '304 Patent, and the '458 Patent and are not staple articles of commerce suitable for substantial non-infringing use.

92. Epson's contributory infringement is ongoing.

93. Furthermore, Epson has a policy or practice of not reviewing the patents of others (including instructing its employees to not review the patents of others), and thus has been

willfully blind of American Patents' patent rights. *See, e.g.*, M. Lemley, "Ignoring Patents," 2008 Mich. St. L. Rev. 19 (2008).

94. Epson's actions are at least objectively reckless as to the risk of infringing valid patents and this objective risk was either known or should have been known by Epson.

95. Epson has knowledge of the '782 Patent, the '304 Patent, and the '458 Patent.

96. Epson's customers have infringed the '782 Patent, the '304 Patent, and the '458 Patent.

97. Epson encouraged its customers' infringement.

98. Epson's direct and indirect infringement of the '782 Patent, the '304 Patent, and the '458 Patent is, has been, and/or continues to be willful, intentional, deliberate, and/or in conscious disregard of American Patents' rights under the patents.

99. American Patents has been damaged as a result of the infringing conduct by Epson alleged above. Thus, Epson is liable to American Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

CLARIFICATION REGARDING PATENT EXPIRATION

100. For the avoidance of doubt, American Patents does not seek relief under any asserted patent for acts occurring after the expiration of that patent.

JURY DEMAND

American Patents hereby requests a trial by jury on all issues so triable by right.

PRAYER FOR RELIEF

American Patents requests that the Court find in its favor and against Epson, and that the Court grant American Patents the following relief:

a. Judgment that one or more claims of the '782 Patent, the '304 Patent, the '458 Patent, and the '803 Patent have been infringed, either literally and/or under the doctrine of equivalents, by Epson and/or all others acting in concert therewith;

b. A permanent injunction enjoining Epson and its officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all others acting in concert therewith from infringement of the '782 Patent, the '304 Patent, and the '458 Patent; or, in the alternative, an award of a reasonable ongoing royalty for future infringement of the '782 Patent, the '304 Patent, and the '458 Patent by such entities;

c. Judgment that Epson account for and pay to American Patents all damages to and costs incurred by American Patents because of Epson's infringing activities and other conduct complained of herein, including an award of all increased damages to which American Patents is entitled under 35 U.S.C. § 284;

d. That American Patents be granted pre-judgment and post-judgment interest on the damages caused by Epson's infringing activities and other conduct complained of herein;

e. That this Court declare this an exceptional case and award American Patents its reasonable attorney's fees and costs in accordance with 35 U.S.C. § 285; and

f. That American Patents be granted such other and further relief as the Court may deem just and proper under the circumstances.

Dated: September 15, 2021

Respectfully submitted,

/s/ *Zachariah S. Harrington*

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